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Coast pilot

THE

SOUTH AMERICA PILOT.

PART I.

EAST COAST OF SOUTH AMERICA,

FROM

CAPE ST. ROQUE TO CAPE VIRGINS,

INCLUDING

FALKLAND, SOUTH GEORGIA, SANDWICH, AND SOUTH SHETLAND ISLANDS; ALSO THE NORTH COAST FROM CAPE ST. ROQUE TO CAPE NORTH.

ORIGINALLY COMPILED BY

STAFF-COMMANDER JAMES PENN, R.N.

FOURTH EDITION.

[J. J. P. Hitchfield.]

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

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31, POULTRY, AND 11, KING STREET, TOWER HILL.

1893.

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ADVERTISEMENT

TO FOURTH EDITION.

THE South America Pilot is comprised in two volumes. Volume I. contains directions for the east coast of the continent from cape St. Roque to cape Virgins, including Rio de la Plata with its principal tributaries; the Falkland, South Georgia, Sandwich, and South Shetland islands. It further describes the north coasts of Brazil and French Guiana from cape St. Roque to cape North, and includes the river Amazon with its principal tributaries.

The coast from Rio Mossoro (meridian of 37° W.) to cape St. Roque and thence to Rio San Francisco do Norte is described from the

By the publication of this Edition, all former Editions, Supplements, and Hydrographic Notices relating to those Editions, as well as all Notices to Mariners up to, and inclusive of, No. 384 of 1893 are cancelled.

SO 11620—2000—11 93 Wt 16821 D & S.

The present edition, by Captain J. J. P. Hitchfield, R.N., contains all the information available to the date of publication, not only from the remark books of officers of H.M. ships employed on the south-east coast of America, but from many other sources.

Mariners are requested to transmit to the Secretary of the Admiralty any notices of errors or omissions they may discover, as well as any fresh information they may obtain, in order that this work may be improved for the general benefit of the navigator.

W. J. L. W.

Hydrographic Office, Admiralty,

***September* 1893.**

[Vol. 2 of the South America Pilot embraces Tierra del Fuego with Magellan Strait, the West Coast of the continent so far as the Bay of Panama, also the Galápagos Islands.]

PRINCIPAL AUTHORITIES.

M. le Baron Roussin, Capitaine de Frégate - - -	1819–20
M. Lartigue, Lieutenant de Vaisseau - - -	1827
Admiral R. Fitzroy, F.R.S. - - - - -	1833
Commander W. Robinson, R.N. - - - -	1838
Charles Phillippe de Kerhallet, Lieutenant de Vaisseau -	1841
Tardy Montravel, Capitaine de Frégate - - -	1842–51
Admiral Sir B. J. Sulivan, K.C.B. - - - -	1845
Commander F. W. Sidney, R.N. - - - -	1856
A. Vital de Oliveira, Commander Brazilian Imperial Navy -	1857–59
M. Mouchez, Capitaine de Frégate - - - -	1863–69
Lieutenant L. S. Dawson - - - - -	1871
Captain W. J. L. Wharton - - - - -	1883
South Atlantic directions, by W. H. Rosser - - -	1870
South Atlantic ocean, by A. G. Findlay - - -	1875
Remark books of officers on the S.E. Coast of America.	

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ON THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

THERE are three descriptions of publications as guides to navigation—the charts, the sailing directions, and the light lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted. The sailing directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the charts must be taken as the guide.*

1. *Charts.*—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the depôts as are required, and are so issued to the ships.

All small but important corrections that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections that cannot be conveniently thus made are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

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The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (which will be found in the lower right-hand corner), in order that at the Admiralty it may be known what edition of the chart is referred to.

2. *The Light Lists*, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer when he receives the set of charts to make notations in the light lists from these appendices, and from the Notices to Mariners in the box; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions may be obsolete, in consequence of changes made since publication.

3. *The Sailing Directions* are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplements or Hydrographic Notices is to be noted, in the tabulated form now being placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices as are of moderate size are now being printed on one side only, and two copies are issued to each ship ; one to cut up, the slips being pasted in at the appropriate place ; the other to retain intact for reference.

To make these notations or paste in these slips is one of the early duties of a navigating officer after drawing his box of charts and books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide ; for which purpose, for ordinary navigation, they are sufficient.

THE USE OF CHARTS AS NAVIGATIONAL AIDS, AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

1. *Accuracy of a Chart.*—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, **and this rule should be invariably followed, viz., that instead of considering a coast to be clear unless it is shown to be foul, the contrary should be assumed.**

2. *Fathom Lines a Caution.*—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

3. *Chart on largest scale always to be used.*—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or soundings. This is an additional

reason, besides the obvious one of the greater detail shown on a larger scale chart, why this largest scale chart should always be used for navigating.

4. *Caution in using small Scale Charts.*—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

5. *Distortion of Printed Charts.*—The paper on which charts are printed has to be damped. On drying distortion takes place, from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

6. *Buoys.*—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

7. *Lights.*—Circles drawn on charts round a light give no information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show equally in all directions, the bearings between which the variation, or visibility, or obscuration of the light occurs.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height at end of each Light List affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more

or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of any power. (*See* table in Light List above mentioned.)

8. *Fog Signals.*—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the origin of a sound, even in clear weather. Therefore too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

9. *Tides and Tidal Streams.*—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 98 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs in temperate regions at the equinoxes, but wind may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

10. *Current Arrows* on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

11. *Fixing Position.*—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station pointer, which is in every chart box.

The latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle-fire may make it undesirable to expose the

person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed.

In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is now supplied in all chart boxes.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

In ships still fitted with the Admiralty standard compass, the tripod supplied to hold the lamp will be found of great service in fixing position at night, as by its aid a bearing can be as accurately taken as in daylight. With Thomson's compass bearings can also be accurately observed at night. The utility of this in connection with ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line, provided the chronometer is correct. A deep cast at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon, or by observing two or more stars at twilight. The Sumner lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

12. *Change of Variation of the Compass.*—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles. The variation chart should be consulted on this head.

13. *Local Magnetic Disturbance of the Compass on board Ship.*—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

The law which has hitherto been found to hold good as regards local magnetic disturbance is, that north of the magnetic equator the north end of the compass needle is attracted towards any centre of disturbance; south of the magnetic equator it is repelled.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

14. *Use of Oil for Modifying the effect of Breaking Waves.*—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows :—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain; as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be: hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

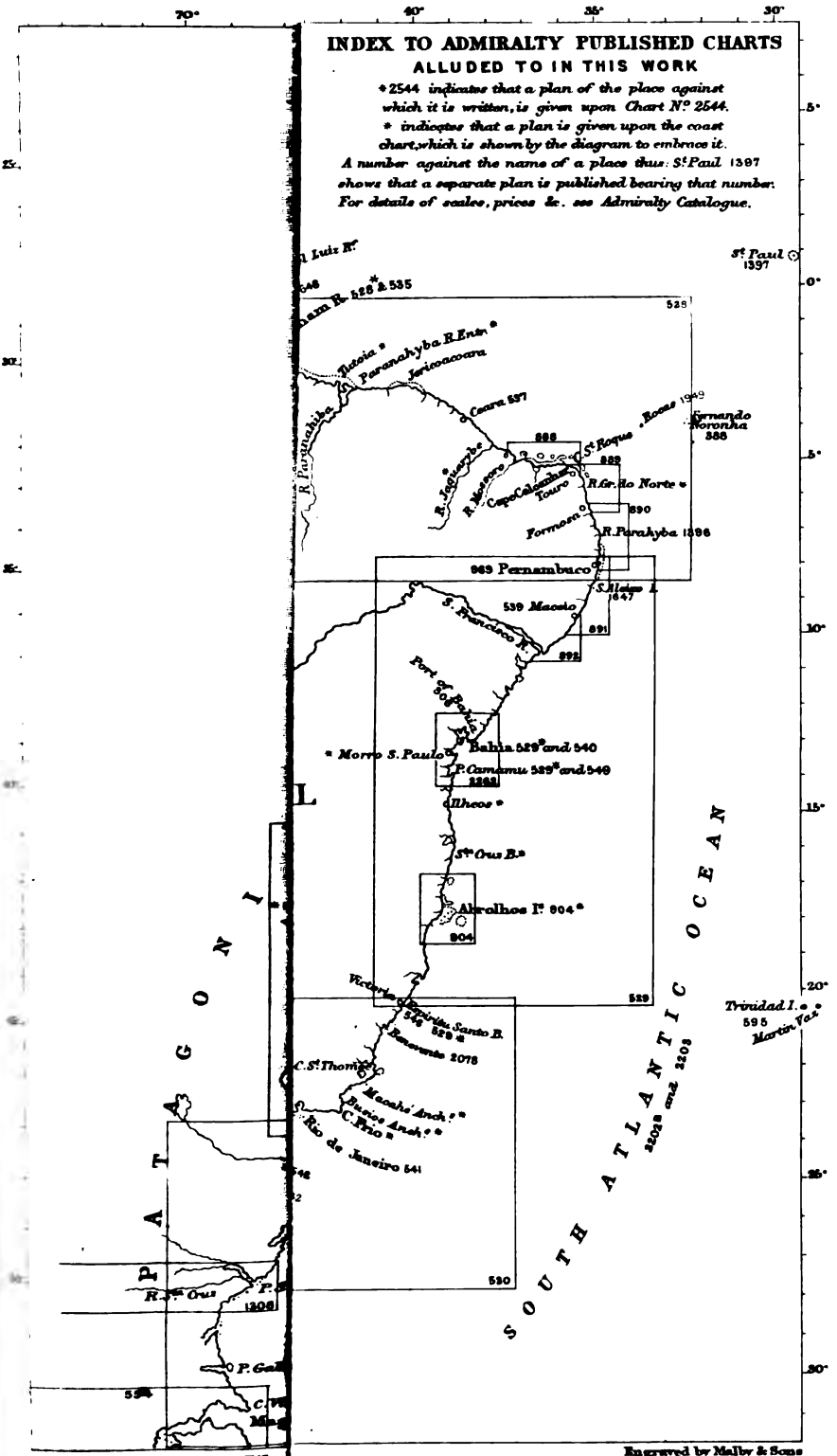
IN THIS WORK THE BEARINGS ARE ALL MAGNETIC, EXCEPT WHERE MARKED AS TRUE.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF 60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO 100 FATHOMS.

THE SOUNDINGS ARE REDUCED TO LOW WATER OF ORDINARY SPRING TIDES.

THE ELEVATIONS ARE ABOVE HIGH WATER OF ORDINARY SPRING TIDES.



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THE

SOUTH AMERICA PILOT.

PART I.

CHAPTER I.

GENERAL DESCRIPTION OF THE BRAZIL, URUGUAY, ARGENTINE

For later information respecting the lights mentioned in this work, the Mariner is referred to the Admiralty Light Lists, part VII.

These Lists are published annually, corrected to the previous 31st December.

SO 11902B—1006—2/96 Wt 24657 D & S

The subsequent descriptive chapters have been arranged to meet what is believed to be the general want of seamen. The outlying islands, with the coast from cape St. Roque to cape Virgins, including the Falkland islands, &c., being first described, and afterwards the coast north-west from cape St. Roque to cape North.

BRAZIL.

The territory of the republic of Brazil is by far the most important of the divisions of South America. It extends from Guayana in the north to the borders of Uruguay in the south, a distance of about 2,000 miles, and possesses a seaboard of nearly 3,000 miles. The area of Brazil is 3,219,000 square miles, and the population amounts to about

S O 11373—2000—11/91 Wt 16556 D & S.

THE

SOUTH AMERICA PILOT.

PART I.

CHAPTER I.

GENERAL DESCRIPTION OF THE BRAZIL, URUGUAY, ARGENTINE AND PARAGUAY REPUBLICS; INCLUDING PATAGONIA; AND THE FALKLAND ISLANDS AND ROCKS.—COMMUNICATION.—COALS.—WINDS AND WEATHER.—BAROMETER AND THERMOMETER.—CURRENTS.—SOUNDINGS.—PASSAGES.

GENERAL REMARKS.—The South America Pilot, Part I., contains a description of the east and north-east coasts of South America from cape North to Magellan strait, including the Falkland islands, Fernando Noronha, St. Paul's rocks, Trinidad, Martin Vaz, South Georgia, Sandwich, South Shetland and South Orkneys islands. A general description of the whole territory embraced by this volume is given in Chapter I., together with general directions for outward and homeward routes, particular descriptions being given in the subsequent chapters.

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The territory of the republic of Brazil is by far the most important of the divisions of South America. It extends from Guayana in the north to the borders of Uruguay in the south, a distance of about 2,000 miles, and possesses a seaboard of nearly 3,000 miles. The area of Brazil is 3,219,000 square miles, and the population amounts to about

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14,000,000. This vast territory presents two contrasted regions; the wide, low-lying and humid forest plain of the Amazon in the north; and the uplands in the south, which are traversed by radiating hills, and mountain ridges, with wide grass plains between woods and bush-covered country. The highest mountain ranges of Brazil rise in the centre of the south-eastern uplands where the Montes Pyreneos rise to a height of 9,700 feet, the coast range or Sierra do Mar, south of Rio de Janeiro reaches nearly the same height, and the Sierra des Orgaõs (Organ mountains) at the back of Rio have summits 7,000 to 8,000 feet high.

RIVERS.—The Amazon (Amazonas), whose great tributaries traverse all the northern lowlands from the slopes of the Andes to the Atlantic, is the largest river in the world. The area of its valley is 2,300,000 square miles, including 45,000 miles of navigable water communication, and its basin is so low that the whole slope from the Andes to the sea is not more than 250 feet. The most remote source of the Amazon is the Ucayali, a branch of which rises near La Paz, in latitude 18° S. The Marañon, a more northern source, rises in the Andes through the Pongo, or rapid of Manseriche, in about latitude 4° 28′ S., longitude 77° 27′ W. Here the stream in breaking through the central cordillera of the Andes flows between enormous masses of almost perpendicular rock of great height, and covered with rich vegetation. The rapid extends for a length of 6 miles, and the river with a width of only 150 feet, flows at the rate of 9 miles an hour, forming dangerous eddies, which will not admit either ascent or descent of the rapid. This point is distant from the Atlantic ocean 2,000 miles, but by the windings of the river 3,500 miles. The river is known as the Marañon as far as the meridian of 65° W., where it is joined by the Japura, and is said to be navigable for light draught steam vessels to Borja in about latitude 4½° S., longitude 77½° W. The main river is not interrupted by a fall for a distance of 2,500 miles, and is navigable as far as Yurimaguas, a distance of about 2,350 miles. In the rainy season the stream runs at about 4 miles an hour.

The various branches and tributaries of the Amazon (*see* pp. 505–511) are a perfect network, among which lakes and lagoons are very numerous. Its great feeders from the southward are the Jurua, Purus, Madeira, Tapajos, and Xingu. From the northward the Japura and Rio Negro, which is joined by the remarkable channel of the Casiguiare to the basin of the Orinoco.

The Tocantins, 1,600 miles long, flows northward through

Brazil, discharging its waters by a mouth 10 miles wide a short distance above the town of Para. Athough this river is considered one of the affluents of the Amazon, it does not, strictly speaking, belong to the Amazon system. The principal tributary of the Tocantins is the Araguaya, which rises on the Serra Cayapa in latitude 18° S., and its course northward forms the boundary between the provinces of Matto Grosso and Goyaz.

Paranahyba river in a commercial point of view is of the highest importance. It is formed by three streams of the same name, that take their rise in the borders of the sierra, which bounds the province of Piauhy on the south-west. The first tributary is Rio Bolsas, to which boats can navigate, the only one, in fact, that joins it on the left bank. Near this confluence, Rio Urussuhy enters it on the right bank, from the same sierra. At 84 miles farther down, the Gurgueia, having taken its rise in the sierra of the same name, and formed in the early part of its course the lake Pernagoa, is incorporated with it.

At 108 miles lower down, it receives the Caninde, which flows from the Sierra dos Irmaõs to the south-east, and at 18 miles farther the Poty falls into it. After 132 miles of its course, it is joined by the Rio Longa; a little below, a small arm issues from the Pernaibaõ to the east, and forms a large lake, called Encantada, the island between it and the river being about 5 miles in length. At 21 miles farther down, near the town of Paranahyba, this river divides itself into two unequal streams, and ultimately enters the ocean by six branches separated by a group of low islands composing its delta.

The eastern branch is named Velha d'Iguaraçu, and those following westward, the Canavieiras or Canarias, the Meio, the Caju, the Carapato, and the Tutoia. With the exception of Barra Velha d'Iguaraçu and Barra Tutoia, which are about 40 miles apart, the other passages have become unnavigable.

Parahiba river rises in the Borborema mountains on the confines of Pernambuco and Parahiba, and flows for about 300 miles north-east and east through the latter province, and falls into the sea by two mouths; during the summer the bed of this river dries at 60 miles from the sea.

Rio San Francisco do Norte has its source near Ouro-Preto, a city situated 150 miles northward of Rio de Janeiro. Its course, which is estimated at 1,600 miles, has a general north-north-east direction as far as the parallel of 9° S., thence it runs in an east-south-east direction to the sea.

Numerous rapids and cataracts, as well as a shallow bar, prevent this river being very useful to outside commerce. The rapids of Paulo Affonço, 60 miles long and 190 miles from the bar, effectually stop any continuous communication between the sea and the country beyond. The river loses its depth and rapidity as it advances through the flat country towards the sea; the banks being subject to great inundations between March and September, when the stream is very strong.

Rio Grande de Belmonte (or Jequitin Hona) rises in the Serra de Pedra Redonda, at 24 miles west-south-westward of the town of Serro, at 300 miles from the sea; its principal affluents are the rivers Macauba, Itucambira, Vacari, Salinas, Aracuahi, &c. Its bed is uneven, and it has two remarkable cataracts. Diamonds are found in the upper part of its course. The river can be ascended to 240 miles from its mouth, but its navigation is little known; it produces numerous fish, particularly a large species of shrimps.

PRODUCTIONS.—The forests of Brazil supply large quantities of useful timber, as well as dyewoods, and gums (such as the valuable india rubber), the coco, sago, and wax palms, nuts and fruit trees of many kinds, and the medicinal chinchona abound; and under cultivation are the coffee and tobacco plants, the sugar cane, cotton, rice, manioc and banana. The mineral products consist of gold, which is found in many parts, especially in the mountains around the head of the São Francisco river; quicksilver, copper, iron and salt are abundant. Brazil is also rich in precious stones.

The large wild animals of the forest are the jaguar, puma, and tapir; and along the streams the capibari, or river hog, is abundant; the rivers teem with alligators and fish; in the woods and grassy plains will be found the rhea or American ostrich, toucans and parrots, and numerous humming birds.

RACES.—The inhabitants of Brazil, present three types—that of the aboriginal Indians, that of the European colonists and their descendants, and that of the Africans introduced originally as slaves. There are also large numbers of half-castes from the intermixture of these types. The aboriginal Indians are found in numerous small tribes in the forests and plains of the interior. The most important section of the European type is the descendants of the Portuguese settlers.

CHIEF TOWNS.—Rio de Janeiro the capital of Brazil is the largest city in South America. Next in importance is the city of Bahia, the oldest city of Brazil. Pernambuco, also named Recife from a reef of rocks which forms the natural breakwater of its harbour, is the third city. Maranhão, on an island of the north coast; Para, the great india-rubber port on the east bank of the Tocantins estuary; Rio Grande and Sao Paulo, with its port of Santos, are the other notable places along the Atlantic coast. In the interior the principal towns are Ouro Preto, in the gold mining region, and Diamantino, the centre of the diamond fields. Cuyaba, in the far west of interior Brazil, is important, as being at the head of the regular navigation into Brazil by way of the Parana and Paraguay rivers.

CLIMATE.—The vast territory of Brazil presents remarkable gradations of climate from north to south; it is, however, greatly influenced by the amount of rain and the duration of the rainy season.

The great northern lowlands possess a very hot and moist climate. On the elevated southern tropical highlands the climate varies considerably, while towards the extreme south it is comparatively cool, with four seasons, heat, however, being the predominating element.

In the northern part of Brazil there are two regular seasons, a wet and a dry. The wet season along the basin of the Amazon, in the north, is from December to July, while the rest of the year is fairly dry. Across the higher southern watershed of this river from Maranho, Acuna, Goyaz, and North Matto Grasso to the falls of the Madura the rainy season is from October to March.

Along the north-east coast through Ceara, Rio Grande do Norte, Pernambuco and North Bahia, the rainy season is from March to August, during which there is scarcely any wind, and the temperature varies but little throughout the day. In the months of January and February, when the winds from E.N.E. are the most frequent and have the greatest force, rain falls for a fortnight or three weeks from cape St. Roque to Pernambuco, but not in any great quantity. This rain is less frequent as we advance southwards. The inhabitants of Pernambuco call the rain which falls at this period "the little rain."

At Ceara, Para, and Bahia the heaviest rains occur in April, while at Pernambuco, July is the most rainy month. The coast from Southern Bahia to San Paulo and the valley of the San Francisco do Norte has a double rainy season, the greater being in April to May, and the lesser in October.

The dry season commences in September and continues till February; during this period there is occasionally lightning and thunder, but seldom rain even in the squalls, which come nearly always from the north and west. During this season it is always cool in the morning and evening, while the heats of noon are tempered by a steady sea breeze.

In the wooded districts of Ceara, Rio Grande do Norte, Pernambuco, and Parahyba, the absence of rain often causes great droughts.

At Rio de Janeiro hot weather prevails from October to May, during which there will be frequent spells of a few days in succession, when, from 10 a.m. till 4 p.m., the temperature will be about 85° in the shade. But commonly such hot spells, after continuing two or three days, are followed by heavy rains, lasting through a night or day, and which leave the atmosphere fresh and pleasant for several days.

It rains much more in the last month of the northerly monsoon, which is generally the dry season, than during the rest of the year. From November to March there are frequent squalls at about sunset, accompanied with thunder and heavy rain, to which succeeds quickly a fine clear sky.

In San Paulo the rainy season is from November till April, south of San Paulo the rains are irregular, and the four seasons begin to be distinguishable.

At Santa Catharina, squalls and heavy rains occur during some months of the dry season. The worst months of the rainy season are marked by frequent fogs, by continual humidity, and heavy rains which prevail sometimes ten or twelve days successively. At this time of the year frequent sickness occurs, occasioned by the excessive damp; the heats which follow increase rather than check it; and it has been asserted that the sickness is great in proportion to the diminution of the average amount of thunder experienced at the time of the equinoxes.

The temperature of various places along the coast of Brazil is as follows:—At Para and Maranham the mean is about 76° at night to 84° in the day, and sometimes it reaches to 95°; at Para the temperature during three years only once reached 95°; the greatest heat of the day, about 2 p.m., ranges generally between 89° and 94°; the air is never cooler than 73°, and the mean of the year is 81°; at Ceara it ranges from 83° in the coldest to 95° in the hottest months; at Pernambuco it varies from 77° to 86°, with a slight decline in the

rainy season; at Bahia, from 75° to 85°; at Rio de Janeiro it is a little less than at Bahia, and the mean temperature for 30 years is stated to be 74°. At Santa Catharina it descends to 54° during the winter months, in June and July; and at Rio Grande do Sul, during the same months, to 44° and 40°; and it rises to 88° in summer.

URUGUAY.

The Republic of Uruguay or the Banda Oriental as it is more commonly called, occupies the north side of the Rio de la Plata, opposite the Argentine republic, and is separated from it on the west by the river Uruguay which gives its name to the Republic. It is the smallest independent State in South America, and has an area of 72,172 square miles, with a population of about 700,000.

In the north where it touches Brazil, spurs and offshoots of the great plateau reach southward across the boundary, the principal chain of hills is the Cuchilla Grande which terminates at Monte Video; the west and south are characterised by undulating grassy plains. The most important river is the Rio Negro which has a course of 270 miles from the sierras of Tacuarembo to where it joins the Uruguay below Fray Bentos, after draining the greater part of the central region.

Monte Video, the capital of Uruguay, situated on the north side of the estuary of La Plata, is a well built city, and has an extensive commerce with all parts of the world.

PRODUCTIONS.—The soil of Uruguay is rich and fertile, producing in abundance every kind of grain or fruit known in temperate or sub-tropical climates. The medicinal plants comprise poppy, wormwood, gentian, balsam, coriander, camomile, liquorice, marsh-mallow, rosemary, elder, and sarsaparilla. The wealth of Uruguay is chiefly in its pastures, which support immense herds of cattle, horses, and sheep.

CLIMATE.—Uruguay is a healthy pastoral country, the winters are cool, wet, and variable. The climate of Monte Video is similar to that of Buenos Aires, except that it is about 8° cooler in the hot season.

ARGENTINE REPUBLIC.

Next to Brazil the Argentine Republic is the largest State of South America. Its territory reaches from the slope of the Andes to the Uruguay river; and from the basin of the Pilcomayo river, on the

borders of Bolivia, southward for a distance of 1,200 miles to the Rio-Negro, which separates it from Patagonia. It is estimated to contain 1,095,013 square miles, with a population in 1891 of about 4,200,000. By the treaty of 23rd July 1881, with Chile Patagonia and Tierra del Fuego were divided between these two Republics. (*See* page 11.) With the exception of the north-west part of the Argentine Republic where the spurs of the Andes reach down to the State, the surface of the country presents vast level plains, broken only by the detached ridges of Cordova and San Luis in the western interior. In the central and southern regions the treeless plains or pampas are covered at most seasons with coarse grass, which is green during the winter months, but dries up in the summer and gives an aspect of aridity to the plains. Some portions of the interior, named Salinas, are barren and white throughout the year.

RIVERS.—The Parana river, the great watercourse of the country, rises in the mountains of Goyaz in Brazil, north-west of Rio de Janeiro. (*See* pages 288–293.) It flows southward, receiving several large affluents, and separates Paraguay from Brazil and La Plata.

The total length of the Parana is about 2,100 miles—namely, 500 from the source of the Rio Grande to its confluence with the Paranahiba, 1,000 from thence to the union of the Paraguay and Parana, and about 600 from that point to the Rio de la Plata. In all the upper part of its course, as far as the province of Misiones, the river flows through a mountainous country, between scarped and tortuous shores, which renders it unnavigable; and its breadth does not exceed from 450 to 550 yards. But below the Salto d'Apipe, a distance of 728 miles from its mouth, the aspect and nature of the country is quite opposite.

About 450 miles above Corrientes is an immense waterfall, named Guaira Fall, the noise of which it is said may be heard at the distance of 20 miles.

Below Corrientes the river acquires an average breadth of one to 3 miles; sometimes in the great rise of its waters, the breadth extends many miles; great changes then take place in the configuration of the river; new islets are formed, and others carried away by the current, the channels are always shifting, and there is often great difficulty in finding the route. In the upper part, the bed of the river is composed of rocks, but below Corrientes it is of shifting sand, and sometimes with a little clay.

The Parana is subject to a periodical rise, and is highest from March to June, which then permits vessels of 17 feet draught to navigate to Rosario; 12 to 13 feet draught to Corrientes, and to the Paraguay. Vessels of 10 feet draught can reach the town of Parana throughout the year; those of 7 feet draught can reach Corrientes at low river (December), and of 3 feet draught as far as Ituzaingo, abreast the Salto d'Apipe.

The Paraguay river, the principal affluent of the Parana, issues from several lakes in the Sierra Diamante in Brazil, at the height of 1,020 feet above the sea, in about latitude 13° S., longitude 55° 40′ W., and flows southward for 850 miles, but taking into account its detours, it is little less than 1,400 to 1,500 miles; it traverses the great marsh of Xárays in all its length, and falls into the Parana a little above Corrientes, 650 miles above Buenos Aires, and separating La Plata from Brazil and Paraguay. Its whole length from its source to 14 miles north-east of Corrientes is about 1,890 miles.

The height of the river above the level of the sea, at Asuncion is 253 feet, and at its sources in Matto Grosso 1,000 feet. The breadth near Asuncion varies between 220 and 550 yards.

The two banks of the Paraguay are in general of the same aspect, having the same small cliffs of the average height of about 6 to 13 feet, which are broken by a number of rivulets from the marshes. Of the two the left bank is higher; both slope downwards towards the interior, there being generally but a narrow strip of dry ground between the river and the lagoons and swamps. Most of the trees that grow on the edge of the river are of little use except as fuel, which is suitable for steaming purposes. Great numbers of carpinchos,* different species of deer, game of many kinds, large numbers of caimans, birds of the marsh, &c., are seen. Alligators and jaguars are numerous.

The Paraguay like the Parana is subject to a periodical rise, being usually highest in May and June, when vessels of 12 feet draught can reach Asuncion, those of 9 feet can reach it the greater part of the year; but during low river those only of 8 feet can reach it. (*See* page 293.)

The Pilcomayo, a tributary of the Paraguay has a course of about 1,600 miles from its source in Bolivia to its junction at Asuncion. This river was explored by Father Paliño in 1721, and again by Lieutenant Von Nivel in 1844, but it is little known.

* Carpinchos are about the size of our pigs, and their flesh is of fair taste, but they are reputed as being very unhealthy. The flesh of the young ones is said to be scarcely distinguishable from lamb.

The Vermejo the next affluent south of Pilcomayo is 1,300 miles in length from its source in Bolivia to its junction with the Paraguay, near Humaita.

The Uruguay river rises in Brazil, in the Sierra de Santa Catharina, and flows first west and then south, separating Brazil and Uruguay from La Plata, and falling into the Rio de la Plata, where its waters preserve their clearness for miles before they are lost in the muddy current from the Parana. Its whole length is nearly 900 miles, and it is navigable for vessels of about 12 feet draught as far as Concordia and Salto (about 240 miles above Buenos Aires), and for very light draught steamers or boats, with a high river (maximum in November), beyond it. The navigation is easier than that of the Parana; the currents are not so strong, and there are fewer banks. The most difficult parts are usually marked by buoys or stakes, but they are often washed away.

The Negro is formed of two confluent streams, the northern named Neuguen, rises in the Andes south of Mendoza; and the southern, Limay flows out of lake Nahuelhuapi, from which it runs in a northerly direction about 140 miles thence south-easterly 500 miles to its mouth in lat. 41° S.

CLIMATE.—The climate of the Argentine Republic in the far west is warm and dry as far as the slopes of the mountains, where rains are of frequent occurrence; that of the central pampas is wet, while the eastern sea-girt portion, including the province of Buenos Aires, is most humid and variable, the changes being brisk and frequent. The mean annual temperature of the city of Buenos Aires is 61°, the mean of the month of January 79°, and that of August 51°, while the extremes vary between 96° and 35°, the thermometer often falling in a few hours on the result of storms, which are frequent, as much as 50° or 60°. From July to December fogs and rain are apt to prevail, but during the rest of the year the sky is bright, the atmosphere clear, and though rain is not so heavy as in winter, heavy dews supply its place. The autumn from March to June is the most pleasant time of the year, but the summer, though hot, is generally breezy and agreeable.

The alternations of heat and cold are great in the interior plains, and dry, cold winds, called pamperos, blow with considerable violence.

The northern part of the country is exceedingly hot, and in many districts subject to inundations.

PARAGUAY.

Paraguay is the only republic of South America that has no sea coast. It lies between the great river Parana and its large tributary the Paraguay. These rivers embrace the territory east, south, and west. On the north its limit with Brazil is the river Apa, a tributary of the Paraguay, and the heights of Maracaju which extend from the head of the Apa to where the Parana forms its great waterfall of Guayra, near lat. 24° S. Paraguay has an area of 154,400 square miles, with a population of about 481,000. A range of heights at an elevation of about 2,000 feet and forming part of the great table land of Brazil, stretches southward through the midst of the country, separating the tributaries of the Parana from those of the Paraguay. The south-western part of the country, where the Parana and Paraguay rivers approach each other until they unite, is occupied by very extensive marshes.

PRODUCTIONS.—The forests of Paraguay are noted for thei splendid timber trees; but the most important natural production is the tea named Yuba maté, made from the dried leaves of a species of holly that grows along the central heights. Tobacco and mandioca are cultivated in small quantities all over the western part of the country.

CHIEF TOWNS.—**Asuncion**, the capital, the only large town of Paraguay, stands on the summit of the steep bank of a lagoon, on the eastern side of Paraguay river, and contains a population of about 35,000. Villa Rica in the centre of the southern part of the country, and Concepcion, on the Paraguay above Asuncion, are the only considerable towns besides the capital. The ruined fortress of Humaita, on the Paraguay near its confluence with the Parana, is remarkable as having withstood a siege of several years against the united forces of Brazilians and Argentines.

CLIMATE.—In Paraguay the hot season extends from October to March, and the cool for the rest of the year. The mean annual temperature is 75°, and the rainfall about 60 inches.

PATAGONIA.

The territory of Patagonia extends from the Rio Negro to Magellan strait. The boundary line dividing this territory between the Argentine and Chilian republics by the treaty concluded with Chile

in 1881, starts from Dungeness the north-east entrance point of Magellan strait, passes in a curved line through mount Dinero, and by the highest ridges to mount Aymond, thence to the intersection of the meridian 70° W. with the parallel of 52° S., from which it extends to the watershed of the Andes. The Argentines keep a small military colony at the mouth of the river Santa Cruz in representation of their claims. Towards the Pacific, Patagonia is bordered by the southern Andes, many of the peaks of which are volcanoes. Towards the Atlantic the long eastward slope of Patagonia, presents a succession of bare plains, grass covered in parts like the Argentine pampas. Several rivers, the largest of which are the Rio Negro, the Chupat, and Santa Cruz, flow across the eastern slope to the Atlantic.

CLIMATE.—The climate of southern Patagonia is very severe; the streams are frozen over till September, and the winter winds blow over the bare plains driving clouds of snow and sand with great violence.

RACES.—The Patagonian Indians are very few in comparison with the vast extent of country over which they wander. The Tehuelches, or southern Indians, are tall, fine people, nomadic hunters of the guanaco and ostrich. The north-west part is occupied by the Manzanas, a less nomadic people, possessing flocks of cattle and sheep, and allied in language to the Araucanians of southern Chile on the opposite slope of the Andes.

FALKLAND ISLANDS.

The Falkland islands, belonging to Great Britain, form a group in the South Atlantic, consisting altogether of above 100 islands. They lie off the coast of South America, about 350 miles eastward of Magellan strait, between latitude 51° and 52½° S., and longitude 57½° and 61½° W. Only two of the islands, named East and West Falkland, are of any considerable size, and these are separated from each other by a sound varying in breath from 2½ to 18 miles. The whole group comprises an area of 6,500 square miles, and is indented in a remarkable manner by sounds and bays, which form excellent harbours, and these, together with the varied outline of the mountains, constitute the principal features in the general aspect of the country.

These islands were seen by Davis in 1592, in Cavendish's second voyage, and visited by Hawkins in 1594. In 1690, Strong sailed through the channel which separates the islands, and named it

Falkland sound, which name afterwards was transferred to the whole group. In 1710 a French vessel from St. Malo touched at them, and named them Iles Malouines. Settlements were afterwards formed on them by the French, Spaniards (who term the group "Malvinas"), and English alternately, which will account for the foreign names of some of the ports and harbours; they have ultimately remained in possession of the English.

The government is administered by a Governor, who resides at Stanley, aided by an Executive and Legislative Council. The members of both Councils are appointed by the Crown.

Nearly all the islands of any size are inhabited. The positions of the settlements will be seen by a reference to the Admiralty chart, a knowledge of which would be invaluable to shipwrecked mariners seeking relief.

The population in 1882 amounted to 1,583; the tonnage of vessels entered in that year was 40,470 tons. The value of wool exported amounted to 70,926*l.*; other exports consist of provisions, hides, horns, hoofs, bones, and tallow.

Aspect.—In the general appearance of the Falkland islands there is little remarkable. Ridges of rocky hills above 1,000 feet high are seen traversing extensive tracts of moorland, without a tree, and bounded by a low rocky coast. On the northern part of East Falkland the hills attain a considerable elevation, but the whole of the south portion is so low that it can barely be seen from the deck of a ship at 5 miles distant. The principal range of hills are the Wickham heights, stretching east and west, and culminating in mount Usborne 2,245 feet in height, near the western extremity. The average height of the western island is slightly greater than that of the eastern, the highest peak, mount Adam, in the north-west part of the island, reaching 2,290 feet above the level of the sea. On the western face of the island, and on some of the adjoining islets, there are some precipitous cliffs, exposed to the fury of the western seas. The summits of the hills and mountains are rugged terminating in points and ridges, are seldom rounded, and never tabular.

Geology.—The more elevated parts of East Falkland are composed of quartz rocks; clay slate prevails in the intermediate districts. Sandstone, in which are beautifully perfect impressions of shells, occurs in beds within the slate formation; and upon the slate there is a layer of clay, fit for making bricks. A peculiar

feature in the geology of these islands is presented in streams of stones, or fragments of quartz, which appear to flow down the sides of the hills. These streams are from 20 to 30 feet wide, and the stones vary in size from one to four cubic feet, and are spread out in the valleys to a great extent. The soil of the islands is chiefly peat, but near the surface, where the clay is of a lighter quality, and mixed with vegetable remains, it is a good soil, fit for cultivation. Stone of two or three kinds, suitable for building, may be found in different parts of the islands. Lime may be obtained by burning the fossil shells brought from the coast of Patagonia, where the cliffs are full of them; or by collecting shells scattered upon the Falkland shores.

Harbours.—Excellent harbours, easy of access, affording good shelter, with the very best holding ground, are formed by the remarkable indentations of the coasts, and abound among those islands; with due care they offer ample protection from the frequent gales.

Productions.—A remarkable feature in the botany of the Falkland islands is the entire want of trees, but there is a great variety of sweet scented flowers, which in November and December nearly cover the ground. The tussac grass, a gigantic sedgy grass, having blades 7 feet in length and three-quarters of an inch in breadth, was formerly abundant on the mosses, but since the importation of cattle, has disappeared, except where fenced, and on the detached islets. Anti-scorbutic plants are very plentiful in a wild state, such as celery, scurvy-grass, sorrel, &c.; there are also cranberries, and what the settlers call strawberries, a small red fruit growing like the strawberry, but in appearance and taste more like a half-ripe blackberry. A little plant which grows like a heath in many parts of the Falklands, as well as in Tierra del Fuego, has long been known and used by the sealers as a tea plant, but it has a peculiar effect at first upon some people, which is of no consequence, as it soon goes off. Potatoes and other vegetables are grown, but are not usually plentiful.

Animals increase here rapidly, and the quality of their hides or fur improves. It must be remembered that cattle are no longer wild, but are the property of some owner, and there is a penalty for shooting them. Horses, pigs, cattle, hares, rabbits, snipe, geese, and duck are plentiful, sheep have been introduced and found to do exceedingly well. Fish swarm in every harbour during the summer months, and excellent trout are to be caught in the lakes. Mussels and clams are abundant.

Seals and sea elephants were abundant in former years, but were much reduced by indiscriminate slaughter; steps have been taken for their preservation.

Whales frequent the surrounding waters at particular seasons, though their numbers are much reduced.

Cod fishing might be turned to good account by the inhabitants of the Falkland islands.

Should any accident happen to a vessel in doubling cape Horn, obliging her to make for the nearest port at which she could obtain supplies, she would find all she required at the Falkland isles.

Caution.—Water found in pools about the islands should be avoided for drinking purposes. It has caused loss of life amongst those out on shooting excursions.

The Tides differ much as to strength and directions in different parts of this group, but the times of high water, full and change, are between 5 and 8 h.; the range is almost similar everywhere, about 8 feet at springs and 4 feet at neaps, but there is a considerable diurnal inequality. The great tidal wave which causes the streams among these islands comes from the south-east, and splits off Lively island; one part of the flood stream running to the northward, the other to the south-westward past Sea Lion islands, from one to 2 miles an hour near the shore. Along the south, west, and north shores it increases in strength, until among the Jason islands, on the north-west side, it runs 6 miles an hour, and causes heavy and dangerous races. Into Falkland sound the flood stream enters at both ends, meeting near the Swan islands, and causing a double high water.

Currents.—Besides these movements of the surrounding waters, there is a current setting past the islands from south-west to north-east. All parts of their southern shores that are open to the south-west, are covered with trees which have drifted from Staten island, or Tierra del Fuego. Great quantities of this drift-wood may be found between cape Orford and Choiseul bay, an interval of coast in which a vessel may not otherwise find a good supply of fuel. On Breaker island and in the bays behind the southern Sea Lion islands, portions of Fuegian canoes have often been found. At sea, when north-eastward of the Falklands, great quantities of drift-kelp are seen, besides water-worn trunks and branches of trees, near which there are generally fish, and numbers of birds. These sure indications of a current from the south-west have been met with upwards of 200 miles from the islands. There is not, however, reason to think

that the current ever runs more than 2 knots an hour under any circumstances, and in all probability its usual set is even less than one knot.

During and after long continued south-easterly gales, when a heavy sea is rolling in on the south and south-east coasts of the Falkland islands, there is stated to be a strong set to the north-westward, to which set has been attributed the loss of several vessels in the neighbourhood of Bull point. Vessels from cape Horn, therefore, intending to sight Beauchêne island, should make due allowance against a possible set of 20 to 30 miles a day to the north-westward.

Winds.—Wind is the principal evil at the Falklands; a region more exposed to storms both in summer and winter it would be difficult to mention. The winds are variable; seldom at rest while the sun is above the horizon, and very violent at times. During the summer, a calm day is an extraordinary event. Generally speaking, the nights are less windy than the days; but neither by night nor by day, nor at any season of the year, are these islands exempt from sudden and severe squalls, or from gales which blow heavily, though they do not usually last many hours.

The prevalent direction of the wind is westerly. Gales in general commence in the north-west and draw or fly round to the south-west; and it may be remarked, that when rain accompanies a north-west wind, it soon shifts into the south-west quarter, and blows hard. The average daily velocity of the wind is about 340 miles; the greatest velocity recorded during 24 hours was 999 miles on June 18th, 1877; and the least 66 miles on July 1st, 1877. Northerly winds bring cloudy weather, and when very light they are often accompanied by a thick fog; it is also worthy of notice, that they almost always occur about the full and change of the moon.

North-east and northerly winds bring gloomy overcast weather, with much rain; sometimes they blow hard and hang in the N.N.E. accompanied by thunder and rain, but it is more common for them to draw round to the westward. South-easterly winds also bring rain; they are not frequent, but they blow hard, and as the gale increases, it hauls to the southward. During winter, the winds are chiefly from the north-west; and in summer, they are more frequently south-west. Though fogs occur with light easterly or northerly winds, they do not often last through the day. Gales of wind as well as squalls, are more sudden, and blow more furiously from the southern quarter, between south-west and south-east, than from any other direction.

Wind from the east is rarely lasting, or strong; it generally brings fine weather, and may be expected in April, May, June, and July, rather than at other times; but intervals of fine weather (short indeed), with light breezes from E.S.E. to E.N.E., occur occasionally throughout the year. Neither lightning nor thunder are at all common; but when the former occurs, easterly wind is expected to follow. If lightning should be seen in the south-east while the barometer is low, a hard gale from that quarter may be expected. South-east and southerly gales last longer than those from the westward, and they throw a very heavy sea upon the southern shores. In the winter there is not, generally, so much wind as in the summer, and in the former season, the weather, though colder, is more settled and considerably drier.

Every material change in the weather in the vicinity of these islands is foretold by the barometer, if its movements are tolerably understood by those who consult it, and if it be frequently observed.

Barometer. — The mean pressure for the year 1876 was 29·616 inches, and for 1877, 29·575 inches; the highest monthly mean for the years 1875–76–77 was 29·761 inches, in September, 1875; and the lowest 29·342 inches, in February, 1876. The maximum pressure registered was 30·479 inches, on July 31st, 1877 at 9 a.m., and the minimum 28·559 inches, on September 19th, 1877, at 9 a.m.*

Climate.—Ice has not been known to exceed an inch in thickness: snow seldom lies on the low lands, or at any period exceeds 2 inches in depth. Although rain is frequent, it does not continue falling for any considerable time; and as evaporation is rapid, in consequence of so much wind, there are no unwholesome exhalations; indeed, the climate is exceedingly healthy, and no disease whatever has been hitherto contracted, excepting ordinary colds or coughs, or rheumatic affections brought on by unusual exposure to the weather. It is said by those who have had the most experience, that the climate of West Falkland is milder than that of the eastern island. Probably the west winds are chilled in passing over the heights, and upon reaching Stanley harbour become several degrees colder than when they first struck upon the western islands.

Thermometer.—The warmest month is January, and coldest July. The annual mean temperature is about 43°. The maximum

* From observations taken by Mr. Cobb, during the years 1875–76–77, at Stanley.

temperature registered during the years 1875–76–77 was 76° on January 27th, 1877, and the minimum 18·9° on July 17th, 1877.*

Rainfall.—The rainfall is not large, the annual amount being about 20 inches, yet the number of rainy days is considerable, the rain falling generally in small quantities.*

CAUTION.—Kelp.—In approaching any part of the Falkland islands, and especially while entering a harbour, a careful look-out should be kept for "fixed kelp," or the sea-weed which grows on almost every rock that is covered by the sea, and not very far beneath its surface. Lying upon the water, the upper leaves and stalks show almost as well as a buoy, where there is a possibility of hidden danger. Long stems, with leaves lying regularly along the surface of the sea, are generally attached to rocky places, or else to large stones. In passing to windward of patches or beds of kelp, or rather in passing on that side from which the stems stream away with the current, care should be taken to give the place a wide berth, because the only part which shows when the tide is strong, lies on one side of, not over the rocks. Where the stream of tide is very strong, this kelp is quite "run under," or kept down out of sight, and can no longer be depended on as a warning. When a clear spot is seen in the middle of a thick patch of fixed kelp, one may expect to find there the least water.

In general, danger will be avoided by keeping clear of kelp, but this must not prevent attention to the lead, as the rule sometimes fails. If the entrance to a port cannot be gained by good daylight, a vessel should stand off again, as the kelp is the only true guide in entering.

Drift kelp, or that which is floating on the surface of the sea, unattached to any rock or stone, of course need not be avoided; and it may generally be known by its irregular huddled look.

COMMUNICATION.

Rio Grande do Norte.—There is communication with the interior by the Natal and Nova Cruz Railway, length 86 miles in March, 1889.

Parahiba.—There is communication by steam vessel from Parahiba river to Pernambuco and other ports in Brazil; and by

* From observations taken by Mr. Cobb, during the years 1875–76–77, at Stanley.

railway from port Cabedello at the entrance of the river to the city of Parahiba.

Pernambuco.—Several lines of mail steam vessels, including the Pacific Steam Navigation, and Royal Mail Companies, call at Pernambuco. There is communication with the interior by the Pacific and San Francisco, Pernambuco Railway, also by the Great Western of Brazil Railway. Pernambuco is connected by telegraph with the principal ports in Brazil; with Cape de Verde islands, Madeira, Lisbon, and Fernando Norouha.

Maceio.—There is communication by the Alagoas Railway from Maceio to Imperatriz; length open to traffic in 1888 was nearly 55 miles.

Bahia.—Three lines of British steam vessels; also French, German, American, Spanish and Brazilian steam vessels call at Bahia. Several lines of railway connect Bahia with other parts of Brazil; and electric telegraph with Pernambuco and Rio Janeiro.

Rio de Janeiro.—Several lines of steam vessels call at Rio de Janeiro, including the Pacific Steam Navigation and Royal Mail steamers. Shaw, Savill and Albion company's steam vessels also call on the homeward voyage from New Zealand. By the Brazilian Lloyd there is communication with the northern ports of Brazil; also with Monte Video, Buenos Aires and the Paraguay river to Matto Grosso State.

Rio de Janeiro is connected with the interior by railway; the State railways (1888) are the Estado de Ferro Central do Brazil 514 miles, and the Rio de Ouro 40 miles in length. Petropolis, a town situated high amongst the Organ mountains is connected by railway with the northern shore of the harbour. Electric telegraph to all the principal Brazilian ports.

Santos.—There is a steam vessel to Rio de Janeiro every five days; also a railway to San Paulo and Rio. Santos is in telegraphic communication with Rio and Monte Video.

Rio Grande do Sul.—There is constant steam communication with Rio de Janeiro, Monte Video, and other ports, also a railway to Bagé.

Monte Video.—The English lines of steamers calling at Monte Video, are the Royal Mail; Liverpool, Brazil and Plata company;

and Pacific Steam Navigation Company; passage from England occupying 23 to 30 days. Monte Video is in telegraphic communication with all the important ports of Brazil; and with Europe.

Buenos Aires.—There is almost daily communication between Europe and Buenos Aires by steam vessel, the number arriving in the Rio de la Plata averages between 25 and 50 monthly, some of these tranship passengers at Monte Video to the river steamers. Buenos Aires is connected by railway and telegraph with all the principal towns and ports, and by submarine cable with Europe.

Rosario is in railway and telegraphic communication with Buenos Aires and other places.

Bahia Blanca is in railway communication with Buenos Aires and several intermediate towns.

Port Madryn.—A monthly steam-vessel belonging to the Chupat Railway Company runs between Buenos Aires, Bahia Blanca and port Madryn, and the Gulf line of steam-ships from Liverpool call at port Madryn regularly on their passage to and from the West coast, and take grain cargo.

There is a railway to Chupat and telegraphic communication with Buenos Aires.

Falkland islands.—There is mail communication with England twelve times a year by the German "Kosmos" Steamship Company. The steamers call at Stanley on their way to Callao six times a year, and on their return voyage six times a year. Between Stanley and Dartmouth, occupies a period of five weeks. Mails for the islands are also taken to Punta Arenas by the Pacific Company's steamers, where they are picked up by the Kosmos steamers. Communication between the islands is kept up by means of two small steamers.

Ceara.—There is communication by the Booth and Red Cross lines of steamers between Liverpool, New York, Para, and Ceara. Also by Brazilian steamers with Maranham, Pernambuco, and Rio de Janeiro. The town is also in railway communication with Quixada, a distance of 120 miles, and a further extension to Crato is in course of construction (1892).

Maranham.—Navigation with the interior of the province is carried on by two local steam companies. The Maranham Steamship

Company has a direct steamer to and from Liverpool, viâ Lisbon, every month. The Red Cross line have a steamer from Liverpool, viâ Hamburg and Antwerp, calling at Maranham, thence viâ Para to New York, every month; and also one direct steamer from Liverpool during the crop season, every alternate month, returning to Liverpool, viâ Ceara. The Northern Brazil line have a steamer from Liverpool, viâ Hamburg and Havre, calling at Maranham, and on to New York, viâ Para, once a month. The United States Mail Steamship Company, every three weeks from New York and along the coast.

Para.—Communication between Para and the other ports of the empire is kept up three times monthly by steamers belonging to a company at Rio de Janeiro, which receive a large subvention from the government. A line of steam vessels between New York and Rio de Janeiro calls at Para twice a month. There are also two regular monthly lines of steamers from Havre and Liverpool.

Several other companies, having in all about 32 steam vessels, varying in size from 20 to 600 tons, are established for the purpose of navigating the Amazon. The principal station is Para; they perform two voyages a month, as far as Manaos, the capital of the province of Amazonas, and 855 miles from Para, and two to Tabatinga, 1,700 miles distant from Para. At Manaos, cargo and passengers for places higher up are trans-shipped to smaller boats, which go as far as Yurimaguas in Peru. Amazon Steamship Company's vessels occupy five days up to Manaos and three days down to Para.

A steam vessel also makes bi-monthly voyages to Cameta, a town of considerable commercial importance on the river Tocantins. These vessels, with numerous small craft and canoes that navigate the various rivers, may be considered the only means of communicating with the interior; for, although there are tracks leading into the forest from the different towns and villages, there is not a road properly so called in the province.

There is a telegraph station at Para.

COALS.

Coals can be obtained at Pernambuco; Bahia; Espirito Santo bay; Rio de Janeiro; Santos; Porto Pedro; Santa Catharina island; Rio Grande do Sul; Monte Video; Buenos Aires; Rosario; Bahia Blanca; port Stanley (Falkland islands) Maranham; and Para.

WINDS AND WEATHER.

NORTH ATLANTIC.—In the North Atlantic ocean, beyond the polar limit of the trade, the winds are variable, and when the sun is in the northern hemisphere, the prevailing westerly winds are S.W. and W.S.W.; if, on the contrary, the sun be in the southern hemisphere, they are from W.N.W. and N.W. This last period is that of gales and bad weather between North America and Europe. In the English Channel, easterly winds prevail in February, March, April, and part of May; during the other months westerly winds predominate.*

The polar limit of the north-east trade wind in the Atlantic ocean generally extends to the parallel of 27° N. This limitation varies about 3° north or south, with the declination of the sun. During summer the north-east trade sometimes stretches northward of Madeira; this fact is however only an exception.

The equatorial limit of this trade wind is generally variable from the same cause; it travels from 12° N. in August to 2° N. in February, on the meridian of 26° W., but seldom passes southward of the equator. Between the equatorial limits of the north-east and south-east trade winds there extends the zone or belt of calms and light airs called the "doldrums." This zone is narrowest in February and March and broadest in September, averaging nearly 100 miles in the former month and 400 miles in the latter.

When the sun is in the southern hemisphere and at its greatest distance from the equator, the north-east trade wind draws more to the northward and stronger winds are then experienced than at any other time. If the sun be in the northern hemisphere, the trade draws more to the eastward and is lighter. Near the equator, the winds generally draw more from east to south than from east to north.

The north-east trade wind varies considerably under the influence of the land, and to the eastward of long. 25° W., within 400 or 500 miles of the coast of Africa, it blows more from the northward than it does in the open ocean. Between the Canaries and Cape de Verde islands during the northern summer months, it blows from N.N.E. to N.E. for 55 days out of every 100; and during the winter months, from January to March, the wind in the neighbourhood of cape Verde draws to the N.W. and West.

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* *See* Admiralty Pilots charts for the Atlantic ocean; also Wind and Current charts for the Atlantic, Pacific, and Indian oceans.

SOUTH ATLANTIC.—In the South Atlantic ocean the limits of the trade wind vary about 3° north or south with the declination of the sun, as in the North Atlantic. The equatorial limit changes from 3° N. in August (sometimes it reaches 5° N.) to 1° in February on the meridian of 26° W., and the polar limit lies in a line between the cape of Good Hope and the islands of Trinidad and Martin Vaz; beyond this limit westerly winds are predominant, varying from N.W. to S.W., but they are changeable and irregular. In the zone between the parallels of 28° and 35° S. the winds are extremely variable, but those which are from N.E. to N.W. round by north, and from N.W. to S.W. round by west, principally during June, July, and August.

East coast of South America.—During the month of December, when the trade winds have reached their greatest northing, they commence to veer regularly to the southward; the mean direction is then about E. by N. or East on the parallel of Bahia, and N.E. on the parallel of 21° S.; in April they are E.S.E. on the parallel of Bahia, and East or E. by S. on that of 21°.

In April and May the change is more sensible, and continues so until July, when they reach their greatest southing. The winds then blow from S.E. by E. to E.S.E. on the parallel of Bahia, and from East to E.S.E. on that of 21°. At the end of July they begin to shift to the northward; the change is more rapid in the first months; then it continues regularly until December. The average variation is about five points; it is greater to the southward, and on the coast, than seaward.

Between cape St. Roque and Bahia the prevailing wind blows from E.S.E. between September and March, but more southerly during the remainder of the year. Occasional squalls from north to west are experienced during October, November, and December. In April, May, and June, the rainy season, the winds veer at times to S.S.W. with squalls.

Between Bahia and Rio de Janeiro as the southern limit of the trade winds is approached they become variable, and the periodic winds from the N.E. and S.E. are well marked, especially in the neighbourhood of the coast. From September to February, the prevalent winds are from N.N.E. to East, blowing strong in December; in January, February, and March there are occasional squalls from north and west with rain and thunder. In the latter month the winds are light and variable. During April, May, and June the prevailing winds are from S.E. to East, light and variable with occasional squalls and rain from south-west; and thunder storms from north-west. In July

and August the winds are from south-east, occasionally veering to south-west, and blowing strong. Off-shore winds are light and variable, with squalls, rain, and thunder from the south-west and north-west. In September there are light airs from East and South.

In January, off Capes Frio and St. Thomé the proportion of north-east winds to those from south-west is 15 to 1; this is the most unfavourable time for vessels bound to the northward. In December, when the north-east winds are the strongest, they are about 4 to 1. In May, winds from north-east and south-west are about equal. In July, when the wind begins to shift to the northward, there are about two north-east winds to one from south-west.

Off these capes, the south-east winds are the most frequent in October and November, March, April, and May; but in October they prevail the most, being then about 27 per cent.

The Abrolhos squalls are frequent between May and August, when the season is wet; north-west squalls in the vicinity of Rio de Janeiro, named Terre Altos, last about 5 or 6 hours.

Between Rio de Janeiro and the Rio de la Plata from October to April the winds prevail from N.N.E. to E.N.E., and when strong they are followed by a calm and a south-west wind. From May to October, south-west winds prevail with occasional gales from south-east to south-west; during July, August, and September westerly winds are rare, and are usually accompanied by dirty weather.

July, August, and September is the season of the pamperos or south-west storms in the Rio de la Plata (*see* page 278), they extend as far as longitude 48° W., and between the parallels of 31° and 40° S.

On the coast between cape Frio and Rio Grande do Sul, heavy squalls and gales similar to the pampero of the Rio de la Plata, from S.E. to S.W., and occasionally from N.W., are experienced; they seldom, however, last more than a day or two, but blow furiously at times. Their indications are the same as those of a gale in Europe. If the sun sets surrounded by heavy clouds, and the land appears very clear, and near the spectator, the wind may be expected to blow hard from south to south-west. The duration of these gales is less in proportion to their strength. Their strength and duration diminishes in proportion as cape Frio is approached.

When the winds from south-east to south-west of the southerly periodic wind are moderate, they draw to the east during the day, and the west during the night. As soon as the wind veers to the east, the weather becomes fine; but when it draws to the west it

becomes cloudy and unsettled. About 25 miles from the land the ordinary force and direction of the periodic winds will be found. About the equinoxes, but more especially when the sun is advancing northward, calms and light winds, with apparently no settled direction, prevail near the coast, and this may be said to be more particularly the case between the Abrolhos islets and cape Frio.

Between the Rio de la Plata and Magellan strait, westerly winds prevail throughout the year and generally bring fine weather. With moderate north-westerly winds, dense fogs have been experienced from February to October, inclusive, between lat. 46° S., long. 60° W., and lat. 38° S., long. 52° W. On each occasion the fog cleared when the wind shifted to the southward of West. From September to June, the westerly winds are often interrupted at full and change of the moon by south-east gales accompanied by rain, thick weather, and a heavy sea. In May, and June southerly winds are experienced, also during July August, and September, when they are more frequent than in summer; easterly winds bring rain, and sometimes fog.

Severe gales, with a cross and turbulent sea, are frequently encountered to the south-eastward of the Rio de la Plata between 200 and 300 miles from the coast. As these gales are often experienced in a region where sudden changes of temperature are observed, the bad weather may be attributed to the meeting of the warm and cold waters of the Brazil and Cape Horn currents.

The local winds will be found described in the chapters to which they relate.

South-east Periodic wind.—The average direction of the trade wind varies three points between summer and winter, and in the season from April to September the south-east periodic wind is generally replaced by variables from south to west, which are the termination of the pamperos of La Plata. They bring clouds and rainy weather, but arriving in the latitude of La Plata they lose their strength, and last only two or three days, with squalls of some hours' duration, which are succeeded by calms and fine weather, if the wind veer to the S.E. and East.

Besides squalls from the south-west, there are often those from the south-east in the vicinity of the Abrolhos islets, and also from the north-west with rain and thunder, which is felt equally along the coast, and in general a little seaward. During this periodic wind, between Bahia and Rio, at 90 to 120 miles from the land, the winds

are light and variable, with squalls and rain from the south-west, thunderstorms from the north-west and variable winds from East to South.

The barometer will fall 24 hours previous to south-west winds, and rise with those from the east. The rain and wind from the south-west are more frequent at the time of new or full moon; an index of the weather will also be found in the general laws of the evolution of the winds in the southern hemisphere. If during bad weather the wind follows its regular course against the hands of a watch, and veers from S.W. to S.E. and East, it is a sign of fine weather; but if it veer from S.W. to West and N.W., bad weather may be expected.

North-east Periodic wind.—The north-east winds off the Brazil coast commence in September, but it is not until December and January that they acquire their full force, when they are often fresh, but it is rare that within 30 or 45 miles of land they blow hard for more than two or three days; there the winds are generally more moderate, allowing coasters to work to the northward. During this season the weather is fine, the sky clear, but the horizon hazy.

In the vicinity of capes St. Thomé and Frio, the winds during summer often blow very fresh from the north-east, causing much sea and a strong current. Vessels of small steam power can hardly proceed against it, and are often obliged to seek shelter. These strong winds which pass over the low land of cape St. Thomé are checked by the high mountains of Macahé, and are not felt westward of cape Frio.

Land and sea breezes are felt, more or less, along the whole coast of Brazil; the land wind is often feeble, of short duration, and not to be depended on. During the north-east periodic wind the land winds are more regular and stronger than in the south-east, because the trade winds then blow more directly and constantly on the coast, and the reaction caused by the coolness of the nights inland produces stronger and more regular effects. In the south-east periodic wind, the winds being often variable from about S.S.W., the land winds mix or unite with them. The stronger the sea breeze is, so is also the land wind.

North Coast of Brazil and Coast of Guiana.—The year is divided into two seasons on the coast of Guiana; the comparatively cool one from November to May, when the north-east trade wind reaches the shore with some force; and the very hot season from June to November with south-east variable winds and calms.

The rains follow no exact law, but are prevalent always; the greater portion however falls in the early part of the year with the north-east trade.

In the northern hemisphere the trade winds increase in strength and change from E.S.E. to E.N.E. in the month of November, and extend progressively along the coasts of Guiana and Brazil reaching as far as cape St. Roque. In the beginning of December they are generally quite steady at Cayenne, and in January and February they attain their greatest force.

In March these winds become weaker; at sunrise they blow from east and E.N.E., and sometimes in the afternoon and part of the night from N.E.

About the beginning or middle of April, the E.S.E. winds reach the coast of Brazil; they approach first cape St. Roque, then extend to the northward, and soon reach along the coast to the mouths of the Amazon. As soon as these winds have acquired sufficient strength, they overcome those from E.N.E., which in May and June are to be found to the northward of the Amazon; and the latter, inclining more to east and E.S.E., become general along the whole coast of Guiana, and extending to about 250 miles off the land.

At the end of April and during the month of May, the change of season begins to take place; the variable winds extend and approach near the coast, calms and squalls are frequent, and sometimes it blows fresh from the S.E.

In June, the variable winds which extend from the equator to latitude 12° or 13° N., generally reach the coast of Guiana; squalls are still frequent, and the E.N.E. winds are rainy. With a continuance of E.S.E. winds fine weather sets in and the rain is carried to the West Indies.

In July, squalls and calms are less frequent, and the direction of the wind is more from E.S.E. than E.N.E., and the weather is more frequently dry than wet.

In August, September, and October, the winds on the coast of Guiana and Brazil are from E.S.E., and have acquired their full force; they blow almost uninterruptedly; and to the northward of cape St. Roque fine weather prevails. It has, however, happened that in some years the seasons have been entirely reversed.

Near the coast the wind generally decreases during the night; in the morning, the sooner it commences the stronger will be the trade during the day.

Land winds from S.W. to N.W. blow at intervals during all seasons close to the coast; they are less frequent in the beginning than in the fall of the year, and generally last but a short time.

Off the coast of Maranham during January, February, and March, the rainy season, squalls from N.W. to S. W. are experienced, accompanied by thunder and lightning. In the months of April, May, and June, when the change of the season takes place, and also when the E.N.E. winds are followed by those from E.S.E., calms, squalls, and storms are frequent. The change of winds from E.S.E. to E.N.E., which takes place in November, is effected more suddenly; the atmosphere is more tranquil; the squalls, calms, and storms are less frequent.

The general direction of the wind is always two or three points more towards the south on the east part of the coast than on the west part. That is, when the wind is S.E. at cape St. Roque it is E.S.E. at Maranham. and when it is east at cape St. Roque, it is E.N.E. or N.E. at Maranham.*

CURRENTS.

The currents of the ocean are properly distinguished by the different and significant names "stream" and "drift." The drift current is merely the effect of the wind on the surface of the water, as for example, in the region of the trade winds, where the whole surface of the sea generally speaking is converted into a slow current moving to leeward. A drift current is therefore shallow as well as slow, and can run in no other direction than to leeward.

The stream current has been described as an accumulation of the parts of the drift into a collective mass by the intervention of some obstacle. The mass then running off by means of its own gravity, and taking the direction imposed on it by the obstacle, becomes a stream current, in many cases very powerful, pursuing its way like a vast river through the ocean.

Stream currents would appear to be farther dependant on the inequality of heat received by the earth from the sun in the tropical and polar regions. Experience proves that warm water flows in an upper current from low to high latitudes, and thus the diurnal rotation of the earth, as well as the configuration of the sea coast and ocean bed, affects their direction.

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* Captain E. Mouchez, French Imperial Navy.

Equatorial current.—The Equatorial current in its course between the continents of Africa and America, may be considered chiefly as a "drift" current formed of water brought from a cooler region by the south-east trade wind. It may be said to commence in the neighbourhood of Anno Bom island, or just south of the equator, between the second and eighth degrees of east longitude, although from this locality a continuity of the northerly drift along the coast of South Africa as well as from the river Congo may be traced. The surface temperature in its eastern part is several degrees colder for a great part of the year than the adjacent Guinea current, affording evidence of receiving waters from a remote and colder region.

The northern boundary, or rather the well marked line of separation between it and the Guinea current, has been traced in the space extending from the meridian of Greenwich to 23° W., and is found to vary little at the different seasons of the year; for example, in the meridian of 20° W., the "line of separation" in October and November is in 5° N., in March and April in 2½° N.; in 5° West longitude, the "line of separation" appears to be constant in 2° N. In about lat. 5° S. and long. 28° W., the equatorial current divides into two branches, the main branch proceeding in a west north-westerly direction along the north coast of Brazil and through the West Indies; the other is named the Brazil current.

The equatorial current appears to attain its greatest volume and velocity during the season of the northern summer. From the African coast to about the 15° of west longitude, the maximum strength has been observed in June and July; westward of that meridian, at successive later periods, or between July and October; being, however, mainly a drift current it is probably subject to irregularities in strength depending on the winds.

The strength of the current increases as it advances to the westward. On the equator, in longitude 20° W., the strength is from 20 to 40 miles a day, near and westward of the Rocas it is from 20 to 60 miles, and off the river Amazon from 37 to 100 miles a day, and is so uncertain as to require the seaman to be ever on the watch, by following up his astronomical observations night and day.

Counter Equatorial.—Between July and November, within the limits included between the meridians of 20° and 53° W., and between the parallels of 6° and 9° N., the north-west drift from the equatorial current appears to be suspended, and an easterly current prevails (probably an expansion of the Guinea current). Between 53° and

40° W. it attains a rate of 60 miles a day; eastward of 40° it decreases in strength, and between 30° and 20° W. it runs from 30 to 15 miles a day. The southern edge of the stream is from 200 to 400 miles from the coast of Brazil.

This counter current has been variously accounted for; it is probably formed by detached portions of the adjacent streams creating a return current. It seems clearly proved that it cannot be attributed to the outflow from the river Amazon and other large rivers of Guiana, as these lose their influence on the western edge of the equatorial current.

Brazil current.—The direction of the southern part of the equatorial stream appears to turn gradually to the southward on approaching the continent, and from latitude 6° or 7° S. runs along or obliquely towards the coast at the distance of 120 or 150 miles until near the parallel of the Rio de la Plata, where it seems to divide into two branches. The larger taking an easterly direction, forms the cross current of the south Atlantic; the other branch, continuing feebly to the southward, is sometimes met with as far as the entrance to Magellan strait.

Inshore Currents.—Within a few miles of the coast about cape St. Roque, where a tidal influence prevails, the general equatorial current is not felt, and in the space between the southern branch of this current and the coast of Brazil, alternate currents are met with, occasioned by the periodical winds on the coast. The force of these currents depends on the strength and direction of the winds. Between Pernambuco and cape Frio, from October to January, the current generally sets to the south-west from 25 to 30 miles a day; from March to September it sets to the northward, attaining its greatest force in June and July, which is occasionally 48 miles a day. Between cape Frio and the Rio de la Plata, the current generally sets to the southward with north-east winds, sometimes 40 miles a day; south-east winds force the current to the shore with a heavy sea.*

Off the entrance of the Rio de la Plata, the current generally sets to the N.N.W. before and with southerly winds, and to the S.S.E. before and with northerly winds, at rates varying from one to 3 miles an hour. An East and E.N.E. current of one mile an hour,

* H.M.S. *Garnet*, on 28th October 1882, in lat. about 27° S., long. 45° W., experienced a counter current, amounting to 42 miles in a N.E. by E. direction.—Remark Book, Navigating Lieutenant B. Gwynne.

a supposed outfall from the Rio de la Plata, has been experienced, extending nearly to longitude 40° W.

At more than 50 miles from the coast of Patagonia, very little current is found during settled weather and moderate winds, but before strong winds and while they are blowing the current runs at the rate of one or 2 miles an hour in the same direction as the wind. Nearer than 50 miles from the land the current runs stronger —from 2 to 3 miles an hour—particularly near projecting headlands. Generally speaking, the northerly currents have more strength, and run longer than the southerly, they are, however, very irregular. Within a distance of 20 miles from the shore tidal influences alone are felt.

North coast of Brazil and coast of Guiana.—As already mentioned a great part of the equatorial current runs along the north coast of Brazil on its way to the West Indies. Its rate may vary from less than half a mile to 4 miles an hour, according to the distance from the middle of the stream and the season of the year, but it probably attains its greatest strength at 100 or 120 miles from the coast. The outer edge may extend from the coast at a distance of about 240 miles, and its inner edge from less than 15 to more than 45 miles, but the exact position where its strength slackens or its direction changes is uncertain. Within a few miles from the coast tidal streams are perceptible.

During the prevalence of E.N.E. and N.E. winds, a current runs E.S.E. along and near the north coast of Brazil; this fact is well known to the masters of the coasters, and is taken advantage of by them.

The water forced to the westward by the E.N.E winds accumulates on the coast of Guiana; and at Cayenne during the months of January, February, and March, it is about six inches higher than in September and October. In May it begins to fall, when the current appears the strongest; and between Maranham and the Amazon, at 150 miles from the coast, it has been found setting to the westward 4 miles an hour.

SOUNDINGS.

The soundings along the whole coast of Brazil, from cape St. Roque as far south as St. Catharina island, are either too deep or uniform to place much reliance on them in approaching the land; there are, however, places where the timely use of the lead will indicate danger. At about 20 miles northward of cape Calcanhar, the north-

east extreme of Brazil, there is a depth of about 21 fathoms, but 6 miles nearer the cape the bottom is irregular, with depths of 7, 9, and 14 fathoms; at 15 miles eastward of cape Calcanhar, there are 15 to 16 fathoms. Off cape St. Roque, at the distance of 9 miles, there is 3 fathoms; and at 17 miles eastward no bottom with 12 fathoms.

Between Pernambuco and the river San Francisco, the 100-fathom line varies from 15 to 25 miles from the shore; and off St. Antonio point, Bahia, it approaches to within 6 miles of the shore.

On the bank extending eastward from the Abrolhos rocks, the soundings vary from 15 fathoms at 10 miles eastward of the rocks, to 45 and 17 fathoms about 68 miles eastward of the rocks; 18 miles eastward of which the water suddenly deepens to upwards of 230 fathoms. Owing to the broken character of the bottom shown by existing soundings, and to the imperfect nature of the surveys, it is probable that many shallow patches exist in the area for more than 200 miles around the Abrolhos rocks. For description of shoals and outlying banks, *see* pages 140–143.

PASSAGES.*

OUTWARD ROUTE.—FULL-POWERED STEAM VESSELS.

ENGLAND TO BRAZIL.—Mail and similar full-powered steam vessels leaving England and bound to Pernambuco or ports to the southward, should take the shortest navigable route, which passes about 50 miles off cape Finisterre close to Madeira and St. Vincent (Cape de Verde islands) and crosses the equator between 31° and 32° W., thence direct to Pernambuco and along the coast to the intended port. Coal can be obtained in this route at Madeira, Teneriffe, Las Palmas, and St. Vincent.

VESSELS WITH SAIL AND AUXILIARY STEAM-POWER.

Small-powered steam vessels leaving England for ports on the East coast of South America, should, if the wind be unfavourable, use steam to gain an offing to the W.S.W., when the route recommended for sailing vessels should be adopted; steam should be used through the doldrums, and the equator crossed in about 25° W.

SAILING VESSELS.

A sailing vessel leaving England for the East coast of South America should at once make westing, as the prevailing winds are from the westward. With a fair wind, a W.S.W. course should be

* *See* Admiralty charts:—North Atlantic, No. 2,059; eastern portion, No. 2,060*a*; South Atlantic, western portion, 2,202*b*; Pilot charts of the Atlantic ocean corrected to 1878.

steered, until in longitude 10° or 12° W., to enable the vessel to weather Ushant should the wind become adverse. If the wind veer to the westward, the vessel should be hauled to the wind on the tack which will best enable her to approach the proper course, without being drawn into the bay of Biscay, which is especially to be avoided. Rather than run any risk it will be better to make a board to the north-westward, since westerly winds generally veer to the north-west, and if a good offing have been made, the course can afterwards be pursued a point or so free, giving a wide berth to cape Finisterre, as the current in this part usually sets on to the land.

From longitude 10° or 12° W. a course may be shaped for Madeira, which may be passed at any convenient distance. In the winter months it is preferable to pass to the westward of it, for the strong westerly gales which prevail in November, December, and January, produce eddy winds and heavy squalls near the east side of the islands.

From Madeira the best track is to pass to the westward and just in sight of Cape de Verde islands, as the winds are stronger and steadier to the westward than to the eastward of them; but in July good passages have been made to the eastward of those islands.

Routes across the Equator.*—Sailing vessels crossing the equator from north to south are recommended to pursue the following routes, varying according to the season of the year.

In January, though exceptionally fast sailing vessels make good passages by crossing in 30° W., or even west of that meridian, it is not generally advisable to cross the equator west of 26° or 27° W.

In February, March, and April, after passing the Cape Verde islands, vessels should stand to the southward in 26° W., and when southerly winds are met they should keep on the tack which gives most southing, endeavouring to cross the equator not west of 28° W.

In May it is recommended to cross not west of 26° W. The change of seasons takes place then on the north coast of Brazil, so that in addition to the westerly current a south-east wind would be found near the land.

In June, after meeting with southerly winds, (probably in lat. 6° N.,) it is advisable to keep on the starboard tack, if any southing can be made, until a sufficient amount of easting has been made to admit of crossing the equator in 25° W.

* From "Remarks to accompany monthly charts of meteorological data for nine 10° squares of the Atlantic which lie between 20° N. and 10° S. lat. and extend from 10° W. to 40° W. long."—Published by authority of the Meteorological Committee, London, 1876.

In July vessels are recommended to proceed as in June, and endeavour to cross the equator in 24° W. (*see* page 29 for counter equatorial current).

In August the requisite easting should be made when southerly winds are first met, and the equator crossed in about 24° W.

In September the requisite easting should be made as in August; it is recommended to cross not west of 25° W.

In October the longitude of 28° W. is recommended as the extreme westerly limit in crossing; the requisite easting being made, as in August.

In November and December, after passing the Cape Verde islands, it is advisable to haul somewhat to the eastward, so as to be in 25° W. long. when in 6° N. lat., and endeavour to cross the equator not west of 29° W.

The equatorial current is not so strong in the winter as in the summer and autumn months; but the mariner must remember that the strength of that current increases as it advances towards the American coast.

When in the vicinity of St. Paul rocks astronomical observations should be frequently made, the current watched and allowed for, and a good look-out kept, as the rocks are steep-to; and they can only be seen on a clear day from a distance of 8 miles.

Crossing the equator, between the months of March and September, when the wind is from the south-eastward, and the current near the coast of Brazil sets to the northward, it will be better to keep from 120 to 150 miles off the land until well to the southward, and steer so as to be to windward of the port of destination; but from October till January, when north-easterly winds prevail, and the current sets to the south-west, the coast may be approached with prudence, and a vessel may steer according to circumstances for her intended port.

Vessels bound for Magellan strait or cape Horn should take the route recommended from England to Brazil until abreast cape Frio, thence follow the route from Rio de Janeiro to Magellan strait (*see* page 36).

ROUTES BETWEEN THE NORTHERN PORTS AND RIO DE JANEIRO.—Southward.—Sailing vessels bound southward for Rio de Janeiro will probably meet with a north-east wind on about the parallel of cape St. Thomé, but from April to June the chances are the least, there being two days wind from the north-east, against one day from the south-west; and in June, at 240 to 300 miles

from the coast, there are 40 per cent. of north-east winds, against 13 of those from the south-west, and 28 per cent. of those from the south-east. At all other times of the year the winds are favourable.

Northward.—Sailing vessels bound from Rio de Janeiro to the northward during the months of November, December, January and February meet with fresh north-east winds which extend along the coast, especially in the vicinity of cape St. Thomé, and cause a southerly current of about one or 1½ miles an hour, stronger near the coast than in the offing. During this season the wind is less northerly in the offing than near the coast, it is therefore necessary for a sailing vessel to stand from 450 to 600 miles to the E.S.E. and then tack, when the wind will be more to the eastward, and the southerly current less strong.

The months of November and December, especially the latter, are the most unfavourable for vessels bound northward, when it is necessary to stand well to the eastward; but during the two or three other months of the north-east winds, *i.e.*, October, January, and February, a vessel should not stand farther eastward than actually necessary for weathering the Abrolhos islets, as from their parallel northward, the winds will be about East or E. by S.

During the other months of the year, from March until September, a vessel should close the coast as near as possible; taking advantage of the change of wind near the land, and making short tacks to the eastward on meeting the fresh north-east winds off capes Frio and St. Thomé, which sometimes blow during the south-east periodic winds; but they last only two or three days, and are succeeded by calms and light variable winds from S.W. to S.E. Then continue along the coast at the distance of 30 to 90 miles. A more easterly route is generally used, but if bound to Bahia, it does not appear advantageous to stand too far off the land.

OUTWARD ROUTE.—FULL-POWERED STEAM VESSELS.

RIO DE JANEIRO TO MAGELLAN STRAIT.—Mail and similar full-powered steam vessels leaving Rio de Janeiro for Magellan strait, or intermediate ports take the direct route along the coast.

VESSELS WITH SAIL AND AUXILIARY STEAM POWER

Small-powered steam vessels leaving Rio de Janeiro for Magellan strait, or intermediate ports pursue the same route as that given for sailing vessels.

SAILING VESSELS.

A sailing vessel leaving Rio de Janeiro for cape Horn, or Magellan strait, after passing the entrance of Rio de la Plata should keep well in with the coast of Patagonia. This can be done in safety, as the winds are almost always from the westward, and an easterly gale never comes on without ample warning. Cape Corrientes should be passed at a distance of 40 or 50 miles, when a course should be shaped for the centre of the gulf of St. George (about S.S.W.), until southward of Valdes peninsula, then steer to sight cape Blanco. After passing Sea Bear bay keep to the westward, so as to get under the lee of cape Virgins.

This western route cannot be too much insisted on, and a vessel making the passage under sail would do well to make a tack inshore, even though with apparent loss of ground, to maintain it. As long as the wind does not veer to the eastward of south the water will be smooth, and more sail can be carried than if farther out; and should the wind come from S.E. (unless when just off cape Blanco), the land recedes so much as to afford plenty of sea room.

A good look-out should be kept for icebergs and loose ice southward of the parallel of 40° S.*

CAUTION.—The entrance to Magellan strait should be approached with great care. The velocity of the tidal streams, the variability of their direction off cape Virgins, and the absence of good objects with which to fix the ship, make the determination of position, and the steering an intended course very uncertain.

Several reports have been made of vessels striking outside the limits of the dangers charted eastward of cape Virgins, but there is no evidence to show where they struck, as all the accidents occurred at night, and no bearings given, it seems very probable they all touched on the shoals extending from cape Virgins.

HOMEWARD ROUTE.—FULL-POWERED STEAM VESSEL.

MAGELLAN STRAIT TO RIO DE JANEIRO.—Mail and similar full-powered steam vessels leaving Magellan strait for Rio de Janeiro take the direct route along the coast.

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* The German barque *Smidt*, in June 1892, passed a quantity of icebergs in lat. 41° 20′ S., long. 34° 40′ W. The British ship *Cromdale*, in April 1892, sighted a large number of icebergs in lat. 46° S., long. 36° W. During the last 70 years extensive masses of ice have been seen in this locality, and on July 22nd 1892 several icebergs were sighted in lat. 38° S., long. 28° W. In June 1893 a large iceberg was reported in lat. 45° S., long. 60° W. *Vide* Admiralty Ice Chart for the Southern Hemisphere, No. 1,241.

VESSELS WITH SAIL AND AUXILIARY POWER.

Small-powered steam vessels from Magellan strait for Rio de Janeiro, proceed as recommended for sailing vessels.

SAILING VESSELS.

The most favourable route for sailing vessels from Magellan strait or cape Horn is to cross the parallel of 50° S. in about 51° W., and the parallel of 40° in about 45° W. They will thus avoid the region of icebergs often found to the south-eastward of this track; and if bound direct for England supplies may be obtained by touching at the Falklands instead of Rio de Janeiro. This is usually much the shortest route to England.*

The western route, previously described for proceeding southward from Rio to Magellan strait, is also recommended for vessels bound northward, though if it be not intended to call at Monte Video it is of less consequence, as generally no difficulty will be found in closing the land on approaching Rio de Janeiro by the eastern route.

HOMEWARD ROUTE.—FULL-POWERED STEAM VESSELS.

BRAZIL TO ENGLAND.—Mail and other full-powered steam vessels from Brazil to England take the reverse of the outward route.

VESSELS WITH SAIL AND AUXILIARY POWER.

Small-powered steam vessels from Brazil to England take the route similar to that of sailing vessels, but from October to March the season of the north-easterly winds and southerly currents on the coast, easting should be made under steam until in about 30° W., and the doldrums should be crossed under steam. From April to September, the season of the south-easterly winds and north-westerly currents on the coast, steam might only be required to gain an offing and afterwards to cross the doldrums. From the north coast of Brazil steam should be used until in the north-east trade.

SAILING VESSELS.

In leaving the ports to the southward of Pernambuco for Europe, the north-east winds sometimes compel sailing vessels to keep on the port tack 10 or 15 days, and to stand S.E. or even S.S.E. to the

* The numerous icebergs seen, at different epochs, in the space to the south-eastward of the track here recommended, make it advisable not to go farther east. Some of these icebergs have exceeded 20 miles in length, and they were very numerous in 1892, and are still reported, 1893.

parallels of 28° or 32°; and as far east as the meridian of Trinidad island. Then on the starboard tack, it is almost certain that a vessel will weather the easternmost part of the coast. In proportion as she gets to the northward on this tack, the wind will draw from east to south-east. By adopting this course, it will seldom happen a vessel will not be able to pass to windward of the island of Fernando Noronha, and cross the line on the meridians recommended below.

On leaving Pernambuco, which is the most eastern part of Brazil, vessels from a good offing will probably be able to stand well to the northward on the starboard tack. The direction of the coast then inclines to the westward, and the winds in these latitudes being generally from the eastward, they will probably sail free in advancing to the northward; but if the winds will not permit pursuing this route, which will be an exception, it is preferable to make a stretch immediately to the south-eastward; and this rule applies to all the ports on the coast when bound from one port to another, or directly to the northward. Working along the coast, bordered by reefs, subject to currents, and light winds at night, cannot be attended with much success.

Vessels from the south-westward, are recommended to endeavour to cross the equator in the following longitudes, varying according to the season of the year:—In January, February, and March, in about 27° W.; April and May, in about 28° W.; June, July, and August, in 29° W.; September in 27° W.; October in 29° W.; November 27° W.; and in December 29° W.

From the equator, a northerly course should be made to reach the north-east trade wind as soon as possible, and having entered the trade the vessel should be kept well full, so as to get quickly across it to the north-westward. When the northern limit of the north-east trade is reached, the vessel will be in about 26° or 28° N., and in from 38° to 42° W., where westerly winds may be expected.

It is seldom advisable to pass eastward of the Azores. The better course is to pass westward; or should the wind draw to the north-west when near the islands, the most convenient channel may be taken to pass between them.

From April to July, if vessels are passing the Azores so far westward as 43° and in about the parallel of 43°, a look-out should be kept for drift ice, as though it is very unusual for icebergs to be so far to the south-east, yet instances have been recorded.

If easterly winds are experienced after passing the Azores, it will be more advantageous to keep on the starboard tack, and make northing, as westerly winds will probably sooner be found.

CHAPTER II.

BRAZIL COAST.—OFF-LYING ISLANDS AND ROCKS.

VARIATION IN 1893.

St. Paul rocks, 18° 10′ W. | Trinidad island, 17° 0′ W.

St. PAUL ROCKS (Peñedo de San Pedro),* in lat. 0° 55′ N., and long. 29° 22′ W., form a group of volcanic guano-topped rocks about a quarter of a mile in extent, north-east and south-west, the highest rock is 64 feet above the sea, and may be seen from a distance of about 8 miles, the rocks sometimes appear like sails. They are nearly steep-to, having 47 fathoms at a little more than 2 cables from the south-west rock, and 28 fathoms at about half that distance; but no bottom with 50 fathoms at 2 cables from the northern end, or on the eastern side at three-quarters of a cable. A sunken rock, with 5 fathoms or less on it, lies N. by W. about half a cable distant from the southern end of the rocks.

The prevailing wind is from the south-east. During fine weather there is landing in the small bay or opening between the two islets on the north-east side. This bay or cove is 56 yards across at the entrance, 100 yards long, and has from 10 to 5 fathoms water. Fish called cavelli may be caught in abundance, and sharks are numerous. An abundant supply of birds' eggs may be obtained in the season. Fresh water is not procurable.

There is nothing, it will be observed, to indicate the approach to this remarkable group but a vessel's correct position, and although the rocks are accurately placed in the charts, yet lying in the track of many outward-bound vessels crossing the equator, a good look out, making due allowance for the current, is actually necessary.

* *See* Admiralty plan :—St. Paul rocks (Peñedo de San Pedro), No. 1,397; scale, ∞ = 3 inches. H.M.S. *Challenger*, in August 1872, finding good landing and the swell moderate, made fast a hawser to the point on the north-east side of the cove, her bow being in 104 fathoms water.

Current.—St. Paul rocks are situated just within the average northern limit of the Equatorial current, where the stream sets to the W.N.W. at the rate of one to 2 miles an hour. A current of 3 miles running close past the rocks was experienced in H.M.S. *Challenger*, in August 1873, causing a confused sea and eddy race under their lee. The current is stronger in the summer than in the winter months.

VOLCANIC REGION.—Numerous instances have been reported of vessels having struck rocks or sand-banks, in the neighbourhood of the equator, between the meridians of 18° and 25° W., and even as far west as St. Paul rocks. It is now known that the effect of an earthquake at sea is to give a shock to a vessel similar to that felt when striking a rock or sand-bank; many cases of vessels making these reports have been investigated to confirm this.*

There appears also to be an extension of this area, or else a separate area; for volcanic shocks have been felt as far as lat. 23° N. and long. 58° W.

FERNANDO NORONHA,† in lat. 3° 50′ S. long. 32° 25′ W., is about 4½ miles in length, E.N.E. and W.S.W., and its greatest breadth is 1½ miles; it is hilly uneven land, consisting chiefly of an undulating plateau from 100 to 300 feet above the sea; on its northern side is a remarkable hill named the Peak, rising to the height of about 1,000 feet, barren and rugged, which seems to lean to the eastward and overhang its base when bearing S.S.W., and may be seen in clear weather from a distance of more than 30 miles. At the west point of the island is a place named the Hole-in-the-wall, the land being perforated.

The island is thickly wooded, but the trees are only from 6 to 12 inches in diameter, the most common being the *Bara*. On the north side, eastward of the peak, in Peak bay, is the convict village, built in the form of a square. The citadel and principal part of the village is situated on a high rock jutting out into the sea at the end of the landing place, and forming the eastern side of Water bay. Fernando Noronha has long been used as a Brazilian penal settlement. In 1884, when the island was visited by H.M.S. *Amethyst*, the population consisted of 250 soldiers, 500 women and children, and 2,250 convicts under a Governor. Indian corn,

* Among the more recent cases, is that of a rock reported by the *Petunia*, as lying between lat. 0° 25′ and 0° 32′ N., and long. 28° 0′ and 28° 10′ W.; unsuccessfully searched for by H.M.S. *Rambler* in January 1884.

† *See* Admiralty plan :—Fernando Noronha, No. 388, scale, $m=2\cdot2$ inches.

cotton, and various fruits are produced sufficient for the population, though the island is capable of raising much more. The convicts are employed in cultivating the soil and in the various trades they are best acquainted with.

The wet season at Fernando Noronha prevails from March to about the middle of July, during which time it rains heavily night and day. In the first three months of the rainy season thunder and lightning is common, and heavy surfs prevail, especially at Rat island. The dry season prevails during the remainder of the year, the sun being very hot in sheltered places, but tempered in the open by the sea breeze. The temperature at the anchorage (August) was 78°. It is said that earthquakes are never felt here. Rollers set in on the island and landing is nearly always difficult.

Islets.—Off the north-east part of the island are seven islets; the largest and outermost, named Rat island, has two beacons, and is about a mile in length, its eastern point, which is very rugged and precipitous, is 2 miles from Fernando Noronha, making the whole group about 6½ miles in extent. There are also two rocks, named the Brothers, uncovering at low water, about a mile from the eastern part of the island and several along the south-east side, within a quarter of a mile of the shore, one of which, named Les Clochers, has a remarkable peak.

Rocks.—From Tobacco point, the south extreme of the island, a reef extends seaward more than a quarter of a mile; and a rocky patch, on which the sea generally breaks, lies S.E. ¾ S. 1¾ miles from the point, with 9 to 14 fathoms between; when on the rocks the "Peak" is shut in with a high hill on the south shore. A sunken rock lies about a quarter of a mile off the west end of the island, and two others in a line S. by W. ½ W. from the same point, at a half and three-quarters of a mile distant with 30 fathoms water between them.

Supplies.—Water is scarce in the dry season, and when procurable cannot always be got from the shore on account of the surf. It is muddy and brackish, and only got near the beach. Wood may be obtained either from Rat or the main island, but there is difficulty in shipping it, and it is infested with centipedes and other insects. Milk, poultry, fruits, vegetables, and fish may be obtained in moderate quantities. Brazilian vessels of war, and on an average 10 or 12 whalers, visit the islands annually to refit and procure supplies. A small

steamer carries stores, convicts, and mails, about every two months, to and from Pernambuco or Ceará.

Telegraph.—Fernando Noronha in is telegraphic communication with Pernambuco and St. Louis, Senegal.

Anchorage.—The roadstead is off the convict village, on the north side of the island eastward of the Twins. Abreast the peak and citadel the anchorage is said to be quite safe during the months of June, July, August, and September, with south-east and east winds, but at other times the wind is occasionally from N.E., when anchorage in or near Saint Antonio bay, south of Cloven rock, is recommended. With north or north-west winds, which are occasionally felt from December to April, the anchorage is unsafe.*

ROCAS REEF.†—This dangerous coral reef extends about 5 miles in an east and west direction, and 3½ miles north and south; it lies on the parallel of Fernando Noronha, and the east end is 83 miles west from the peak of that island. The reef, which dries about 6 feet, is in general level, but numerous detached rocks lie off the eastern and north-eastern sides, one of which is about 12 feet above high water. Within the reef, the eastern portion is a lagoon, having from 3 to 10 feet water at low tide, to which there is an entrance on the north side during very fine weather; the deeper parts are interspersed with patches of sand. Two islets or sand cays, about 8 feet in height, stand on the reef about one mile from its western extremity. They are about 100 yards in length by 90 yards in breadth, connected at low water by the reef, and lie north and south of each other.

On the northern islet stands an iron lighthouse, a refuge house about 40 feet high, painted white with a red roof, also several small sheds; a useful species of amaranth grows on this islet; on the southern islet are three stunted cocoa-nut trees, which were planted by H.M.S. *Siren* in 1857.

LIGHT.—A white *fixed* light is exhibited from the lighthouse, and should be visible in clear weather from a distance of 10 miles.

Landing.—Heavy breakers mark the position of the Rocas, particularly at the east end, and the remains of many wrecks are scattered over the cays. There is good landing on the reef abreast and to leeward of the northern cay, from three-quarters ebb to a quarter flood; and at high water, just southward of the northern cay.

* Staff Commander Thomas Pounds, H.M.S. *Bristol*, August 1871. H.M.S. *Amethyst* anchored abreast the peak in 8 fathoms (in September), and found it a safe anchorage.

† See Admiralty plan:—The Rocas, No. 1949, scale, $m = 1{\cdot}1$ inches.

There are soundings in from 12 to 15 fathoms, rocky bottom, at 6 miles, 13 and 14 fathoms at three miles eastward of the reef, and from 20 to 23 fathoms at 2 miles westward; but no bottom with 30 fathoms at 2½ miles north-north-eastward, nor with 70 fathoms at 4 miles to the south-westward.

Anchorage.—There is anchorage protected from the swell at about half a mile off the north-western part of the reef, in 8 or 9 fathoms, sand and coral; the coral is easily avoided as the bottom is plainly seen.

Current and tides.—The current in the vicinity of Fernando Noronha and the Rocas sets strong to the westward; at 2 miles westward of the latter it has been found to run at the rate of one to 2½ miles an hour. The many wrecks that have taken place on the Rocas previous to the erection of the lighthouse is sufficient to prove to the mariner the necessity of caution when in the vicinity of this dangerous reef. It is high water, full and change, at Fernando Noronha, at 6h., rise about 6 feet; and at the Rocas at about 5h. 15m., and the rise is 10 feet.

TRINIDAD ISLAND,* in lat. 20° 30′ S., long. 29° 22′ W. (approx.) is about 3 miles in length, in a north-west and south-east direction, and about 1¼ miles in breadth, it is a rugged mass of rocks, the centre peak rising to 3000 feet above the sea, and what soil there is on the island is on the eastern and southern sides. The latter is indented with small bays; but the whole shore is so iron-bound, and there is such a swell surging against it, that it is almost impossible to land anywhere without danger of staving the boat, as the shore is skirted by sharp rugged coral rocks.

On the western side of the island there is a large arch or hole, forming a natural passage made by the sea through a bluff of about 800 feet high; it is about 40 feet in breadth, nearly 50 feet in height, and 420 in length, over a depth of more than 3 fathoms; when the sea is smooth a distant rock covered with shrubs may be seen through the arch, and is extremely picturesque. There are also on the same side of the island two remarkable rocks, one called the Monument or Nine pin, and the other the Sugar-loaf, the latter greatly resembling that at Rio de Janeiro.

* *See* Admiralty plan:—Trinidad and Martin Vaz islands, on sheet No. 595; scale, *m* = 1·67 inches.

The Monument is 850 feet high, of a cylindrical form, with a slight inclination, which makes it look from certain points as if about to fall. The sugar-loaf, at the south-east end of the island, is 1,160 feet high of a conical form. The island was formerly supplied with water from two or three sources, but the springs appear to have almost dried. Vessels have occasionally anchored off the south-western and western sides. The island was taken possession of by Dr. Halley, afterwards Astronomer Royal, on the 17th April 1700, and in 1781, the English tried to form a settlement on it, but failed: and more recently the Brazilians, with like success.

In 1844 Captain Buckle, in H.M.S. *Growler*, visited the island. He says:—"We lay-to off the east side of the island, about a mile from a sandy beach, and I landed without much difficulty on a projecting rock at the south end of the beach. From a distance it appears easy to land, but on approaching the shore we found that below the tide mark the bottom was nearly all coral rock, nearly awash for some distance, with the surf on it, which must always render the attempt to land very injurious to boats, and often dangerous. By keeping the boat's head to the swell, and watching, we effected a safe landing; but it was not without some risk that we got off again, as the water had fallen some 3 or 4 feet in as many hours, and the sea broke occasionally.

"I searched for the ruins of the settlements, but could find no traces of them; the spots where the buildings formerly stood are overrun with the castor-oil plant and coarse grass, growing on a rich mould, apparently favourable for vegetation. The island must be of volcanic origin, and is similar in some respects to the higher parts of Ascension. A small stream of water descends a ravine to a small shingle beach at the south-west end of the island, but I do not trace it thither. At the period we were there, during a perfect calm, I do not think a boat could have filled water, but casks might have been rafted off.

"There was no water on the eastern side of the island, though we observed several dry watercourses. On the higher parts of the island the stems of many dead trees were scattered about, none of them more than 6 inches in diameter, and from 15 to 20 feet in length. They must have been in this state for several years, were perhaps killed by continued drought and then blown down. We saw no trace of an animal of any kind, but the footprints of a large dog, a fishing racoon, or perhaps a wild cat, close to the place where we landed.

"Several kinds of gulls and sea fowls were numerous, amongst them sea eagles, men-of-war birds, and boobies. The gulls were so tame that several were caught by the hand. One species had their nests in holes half way up the Sugar-loaf, which is a truly magnificent rock. Near its base was probably the spot where the settlement was established. A few pieces of broken oars and boats, and a piece of a vessel's bulwarks, were lying on the beach. The only trace of a human habitation was a small space enclosed by a pile of stones about three feet high, close to a detached rock about eight feet high, which formed one side of it, and under which there was a slight hollow, which, with some kind of roofing, afforded shelter for one person to lie under."

MARTIN VAZ ISLETS are three small barren islets or rocks, with a few bushes on them here and there, lying north and south over a space of about 2 miles. The central and largest islet in lat. 20° 29′ S., long. 28° 53′ W. is 300 feet high, and bears E. by S. ¼ S. distant about 26 miles from Trinidad. The two northern islets are separated by a channel about one cable in width, but the southern is three-quarters of a mile distant; they are steep and inaccessible. There is a depth of 12 fathoms water at about three-quarters of a mile W.S.W. of the large islet; the bottom, which is rocky, is visible, and the depths decrease gradually towards the islet, to 1½ fathoms close-to. Rock cod and other fish can be caught. A sunken rock is said to lie at a short mile S.W. by W. of the south islet.

CHAPTER III.

CAPE ST. ROQUE TO BAHIA.

VARIATION IN 1893.

Cape St. Roque -	14° 10′ W.	River St. Francisco do Norte entrance - -	13° 0′ W.
Bahia - -	10° 40′ W.		

CAPE ST. ROQUE.*—From cape Calcanhar in lat. 5° 9′ S., long. 35° 29′ W., the north-east extreme of Brazil, the coast trends in a south-easterly direction 24 miles to cape St. Roque, a slightly projecting point of white sand, 180 feet high, having on it a few scattered tufts of brushwood. There are several small red cliffs near the cape, which show only when the sun shines on them. Between the capes, the shore, which is uniform in its appearance, forms several bays, and is composed of white sandy downs, interspersed with dark green brushwood, cocoa-nut trees, and small villages. At a distance of 16½ miles southward of cape Calcanhar is the low sandy point of Pititinga, which may be known by a large isolated tree on its highest part, with the bay and village of the same name on its north side.

The coast between Pititinga point and cape St. Roque is skirted by shoal, rocky patches, which, between 2 and 2½ miles southward of the point, abreast two small villages, extend 1½ miles from the shore; within the southernmost shoal there are depths of 1¾ and 2½ fathoms. At 2 miles northward of the village of Pititinga is the little river of Quaxinim, and at 2¼ miles farther in the same direction is the river Punahu, off which a reef extends nearly one mile from the shore, decreasing gradually towards Touro, where it extends about half a mile. The chapel and village of Touro, 2½ miles south-eastward of cape Calcanhar, stands on the north side of the river of the same name.

* *See* Admiralty charts :—Saint Roque channel to Formosa, No. 889, scale, $m=0{\cdot}4$ of an inch ; and Maranhám to Pernambuco, No. 528, scale, $m=0{\cdot}05$ of an inch.

The coast from cape St. Roque, northward to cape Calcanhar, and from thence westward, is bordered by a bank with irregular depths and many dangerous reefs, described on pages and . The bank, within the depth of 20 fathoms, follows the trend of the coast at a distance of 12 to 18 miles.

Caution.—Approaching the coast of Brazil care is necessary to guard against the westerly set. During the north-eastern periodic wind the set is generally very strong southward of cape St. Agostinho, and near the salient points, such as the Rio Doce, and capes St. Thomé and Frio; at which time it is weak to the northward.

There is often near the shore under the lee of the capes, such as south of capes St. Thomé and Frio, counter currents to the north-east. Along the coast of Pernambuco there is likewise, sometimes, a counter current which sets with some force to the northward, which is often the cause of vessels when becalmed missing the land intended to be made.

Tides.—It is high water, full and change, at cape St. Roque at 4h. 14m.; springs rise from 8 to 10 feet. In the St. Roque channel the flood sets to the south, and the ebb to the north, at about one mile an hour. The tidal streams are stronger close to the land and in shallow water. The distance off shore to which they extend depends much upon the direction of the wind, and the depth of water, but in general this influence is not felt more than 6 or 8 miles from the coast.* The establishment of the whole eastern shore of Brazil varies but little, as the coast lies nearly in a straight line, and parallel to the tidal wave which traverses the Atlantic ocean from E.S.E. to W.N.W.

Winds.—At cape St. Roque the winds are generally from S.E. to East; during the southern monsoon in June, July, and August they blow from S.S.E. and are often very strong. As the north-west current then attains its greatest strength, these are the worst months to double the cape. In the contrary season—December to March inclusive—the breeze is moderate, blowing from East and even E.N.E., with a smooth sea and a weak current.

ASPECT.—From cape St. Roque southward the coast is composed of low sandy downs, rising to a moderate height towards Olinda point, thence resuming generally its former aspect, which

* Captain E. Mouchez, French Imperial Navy.

will be treated of hereafter. From the parallel of 20° S. or about 180 miles northward of cape Frio, as far south as the island of St. Catharina, the land is generally high, wooded, and may be seen in clear weather from a distance of upwards of 50 miles.

The RECIFE, a singular ridge of coral rock, borders the coast generally at the distance of one half to 3 miles, but in some parts much farther off, and extends more or less from the north-east point of Brazil, as far as Bahia; traces of it may be found more to southward, and also along the north coast to Maranham. The reef, which is about 16 feet in breadth at the top, slopes off to seaward, is perpendicular on the shore side, and is generally covered, but in some parts it is nearly 3 feet above water. It is nearly always bordered by rocky banks, and forms a natural breakwater, having smooth water and shallows inside it, with navigable channels for coasters, and where fish may be caught almost throughout the year. There are occasional openings in the reef communicating with the greater part of the ports, rivers, and creeks on the adjacent coast.

ST. ROQUE REEFS are composed of four groups of coral banks awash at low water. From near cape St. Roque they extend parallel to the coast in a north-west direction for about 23 miles, at about 3½ miles from the shore. There is an inshore passage between the reefs and the main much used by coasters. At high water with strong south-east winds the sea breaks on these reefs, but not at high water, with east and north-east winds. At 5 miles eastward of the reefs a depth of 10 fathoms will be found, diminishing gradually as the reefs are approached. Much care is required in approaching the St. Roque reefs on account of the variable strength of the current: it is rare not to see the remains of wrecks on the reefs.*

Mara cajahu reef, the southernmost of the St. Roque reefs, is nearly 5 miles long in a N. by W. and S. by E. direction, 2¼ miles across, and partly uncovers at certain times of the tide. Its southern extreme lies 3½ miles N.E. by N. from the cape. From the east side of Mara cajahu the water gradually deepens to a depth of 5 fathoms at the distance of one mile seaward.

Fogo reef, the south point of which lies 6½ miles north-west of Mara cajahu reef, and 4½ miles E. ½ S. from the town of Fogo, is 6 miles long in a N.W. by N. and S.E. by S. direction, 1½ miles across, and partly uncovers at certain times of tide.

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* Captain E. Mouchez.

Pititinga channel.—For the distance of 3½ miles southward of Fogo reef there are several shoal banks. Between the southernmost of these banks and the Mara cajahu lies the Pititinga channel, which is 3 miles wide and has depths of 3½ to 5 fathoms.

Cacão and Sioba reefs lie to the north-west of Fogo reef, and are separated from the latter by Touro channel 2½ miles wide, with general depths of 4 to 5 fathoms. Near the middle of the channel there are two patches of 2½ fathoms. Cacão is 1¾ miles long in a north and south direction, and has a depth of 13 feet. Sioba is 2¾ miles long in a W.N.W. and E.S.E. direction, and has a depth of 9 feet. A depth of 3¼ fathoms extends for a distance of one mile seaward from Cacão reef and 2 miles seaward from Sioba reef.

ST. ROQUE CHANNEL, situated between St. Roque reefs and the shore, is 23 miles in length. Westward of Mara cajahu reef there is a depth of 3¼ fathoms; the channel is, however, narrowed in this part to three-quarters of a mile by Panca and Theresa Panca banks, which nearly dry at low water. This channel is much frequented by native vessels, as they have the advantage of a smooth sea, a tidal channel, and some sheltered anchorages; it is not recommended for strangers.

Directions.—In entering St. Roque channel from the southward, the mariner should sight cape St. Roque and approach it within 2 miles, with soundings of about 5 fathoms. A vessel may then steer with Pititinga point which has some cocoa-nut trees near it, a little on the port bow, taking care not to shut in Massaranguape point with cape St. Roque, astern; this will lead through the narrow part of the channel between Mara cajahu reef and the main in 19 feet water: the lead will guide the vessel in keeping clear of the west side of the latter reef.

Between Pititinga point and Fogo village, the channel of deepest water is tortuous, and to steer through it requires local knowledge; but a depth of 14 feet may be carried by steering N. by W. ½ W. from a position 1½ miles east of Pititinga point, until Fogo village bears West, when the channel again becomes straight; thence by keeping at one or 1½ miles from the shore, a depth of 19 feet may be carried.

From the northward, a vessel should sight cape Calcanhar, and approaching it on a S.S.E. bearing, the small group of cocoa-nut trees on Quixida will soon after be sighted and also the two small

black points of Touro, thence proceed to the southward, reversing the above directions.

SHOALS NORTH-WEST OF ST. ROQUE CHANNEL.* —**Urca Cotia,** on which the sea generally breaks, lies 27 miles N.W. ½ N. from cape Calcanhar and 12 miles from the shore, on the parallel of 4° 53′ S. It is nearly 3 miles in length, east and west, and one mile in breadth, with depths of 6 and 7 fathoms close around.

There is a bank with 3¾ fathoms, about 2 miles in extent, and nearly parallel to Urca Cotia, at the distance of nearly 2 miles northward.

Eastward of Urca Cotia, a bank one mile in breadth extends from it nearly 5 miles, having from 4¾ to 5¾ fathoms water over it. From this shoal to within one mile from the shore there are no other dangers, and the soundings decrease gradually from 8 to about 3¾ fathoms.

Albatross shoal, with 5 fathoms water, lies in lat. 4° 5½′ S., long. 35° 38′ W.†

Coroa Lavandeira reef.—At a distance of 3 miles N.W. ½ W. from Urca Cotia is the east end of the Coroa Lavandeira reef, having from 7½ to 9½ fathoms water in the channel between them. This end of the reef is about one mile in breadth, thence it curves south-westward and southward for about 16 miles, increasing gradually in breadth to about 5 miles, and terminating at 2¼ miles from the coast. The eastern and western parts of this reef are reported to have from 9 to 17 feet water, but the central portion for several miles uncovers at certain times of the tides.

Between Corca Lavandeira reef and the coast there are numerous shallow banks having about 3 to 9 feet water, with 15 feet between. Southward of these banks and close to the shore there is a channel named Santo Alberto carrying about 15 feet water, and about one-third of a mile in breadth.

Von Roon rock.—In 1869, the German ship *Von Roon* struck on a rock having a depth of 2¾ fathoms and said to lie in lat. 4° 46′ S., long. 35° 57′ W., 5½ miles northward of the east end of Coroa Lavandeira reef. The exact position of the rock is doubtful.

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* *See* Admiralty chart:—Rio Mossoro to St. Roque channel, No. 868, scale m = 0·4 of an inch.

† Reported from U.S. vessel *Albatross*, 1887.

Urca Conceição.—This cluster of rocks, extending east and west for 2¼ miles, in lat. 4° 54′ S., lies north-westward of the shoal part of the Lavandeira, and N. ½ W., 9½ miles from Caicara village. The Pedra Secca, a patch awash at low water, is 1¼ miles southward of it, and 2 miles from the western edge of the Lavandeira. At 3½ miles W.S.W. of Pedro Secca is a narrow ridge named Risca das Bicudas with a depth of 2 fathoms; north-westward of which, at the distance of 2¼ miles, is a patch of 3¾ fathoms.

Urca Minoto, situated nearly 8 miles westward of Urca Conceição, is one mile in length, and uncovers at certain times of the tides. It lies about N.W. ¾ N. 15½ miles from the village of Caicara, and 13 miles from the coast. At one mile eastward of it is Urca Oliveira with a depth of 2¼ fathoms. These reefs generally break, but more so when the wind is from seaward.

Urca do Tubaraõ.—At about 11½ miles westward of Urca Minoto shoal, on the meridian of Tubaraõ point and nearly 12 miles distant, is the west end of a rocky shoal of the same name with 2¾ fathoms water on it, and about 2 miles in extent east and west.

There is little to indicate a vessel's approach to the vicinity of any of these banks but astronomical observations and the soundings; the bottom is white sand, coral, and gravel. The water near the edges of the banks is green, and contrasts strongly with the water outside. The green water, unless in a small vessel bound inshore, should never be entered; the depths decrease suddenly from 18 to 8 fathoms, or less. The land being low can be seen only in fine weather from a distance of 10 to 12 miles, with the exception of Mount Mangue Secco, southward of Urco Tubaraõ, and which may be seen from a distance of 21 miles; no vessel, unless very certain of her position, should approach it nearer than 35 miles. The current runs strong to the W.N.W. and N.W. The rise of tide on the banks at springs is nearly 10 feet, and at neaps 6 feet.

Having given a description of the dangerous reefs bordering the north-east extreme of Brazil, we now resume the description of the coast from cape St. Roque to the southward.

The COAST, from cape St. Roque, trends in a southerly direction for 13½ miles to Genipabu point, which is 3 miles northward of fort Santos Reis Magos, on the south side of entrance to Rio Grande do

Norte. At 3 miles southward of cape St. Roque is the Rio Massaranguape, with a village and cocoa-nut trees on its north point of entrance. At 3 and 4 miles further south are the villages of Murihu and Jucunen. The Rio Ceara mirim disembogues at 1¾ miles northwest of Genipabu point, having a village between. The shore southward from the Rio Massaranguape is interspersed with groups of cocoa-nut trees, and fronted at a distance of about three-quarters of a a mile by the off-lying reef or recife. At about 2 miles from the coast there are from 6 or 8 fathoms water. Genipabu reef lies nearly one mile E. by S. of Genipabu point, and a similar reef lies at the same distance from the shore about 1½ miles southward of it.

RIO GRANDE do NORTE.*—The approach to this river is through an opening in the reef which covers its mouth and forms a natural breakwater. The southern part of the reef extends northward from the south entrance point a distance of three-quarters of a mile, leaving a passage having about 21 feet water between it and the north reef. Within these reefs a similar reef of 2 cables in length, extending in a north and south direction, rises from the bank on the north side of entrance, with its southern end bearing W. by N., distant 2 cables from the north end of the southern reef, and 4 cables from the shore. In the middle of the entrance there is a serpentine reef, from 3 to 4 cables long, eastward of which lies the channel to the river.

Bar.—Inside the reefs the channel is subject to great changes, and is now much contracted. The bar, which has a depth of only 16 feet at high water springs, is marked by two black buoys.

The river from the entrance to abreast the town is from 2 to 3 cables in breadth, with depths of 4 to 5½ fathoms. The Rio Grande is a considerable stream during the rains, but is much reduced in the dry season, and at about 3 miles above the town its course is obstructed by a sand-bank, having only 9 feet water. At high water the northern bank is overflowed about one mile from the mouth. The entrance is defended by fort Santos Reis Magos, an angular structure, standing in the middle of the southern reef, and insulated at high water. The rise of tide at springs is from 8 to 10 feet.

NATAL, the capital of the province of Rio Grande, stands on the eastern bank of the river, 2 miles within the entrance, and has a

* *See* sketch of Rio Grande do Norte, scale, *m* = 2 inches, on Admiralty chart of South America, No. 528.

population of about 11,000. Its exports are cotton, sugar, dye-wood, and most of the articles that are exported from the other ports in the Brazil, amounting to about £200,000 annually.

During the year 1888, the total number of vessels that entered the port amounted to 49, with an aggregate tonnage of 17,487; and 40 vessels, with a tonnage of 13,980, cleared.

Supplies.—Fresh beef, vegetables, good water, and coal, may be obtained at Natal.

LIGHT.—At the entrance of Rio Grande do Norte, on fort Santos Reis Magos, is a round tower which exhibits, at the height of 43 feet above the sea, a *fixed* white light, said to be visible in clear weather from a distance of ten miles.

Directions.—The land in the vicinity of the Rio Grande do Norte is very low, and there is nothing to indicate the entrance to the river but the fort and lighthouse on the southern reef, which may be seen at a distance of several miles. Vessels bound for this port should make the land to the northward or southward, according to the prevailing current, waiting for slack water to enter, as the tides run very strong, and great care is necessary to prevent being set on the reefs.

Steer for the extremity of the southern reef, leaving it on the port hand, about 30 feet distant, and then haul to the southward to avoid the serpentine reef in mid-channel, passing between the two black buoys, when the western bank of the river must be steered for to give the flat extending from the south point a wide berth. As the channel is narrow, and constantly changing, a stranger should, on no account, attempt to enter without a pilot.*

THE COAST from Rio Grande do Norte trends in a southerly direction for 14 miles to Cotovello point and is composed of white sand. Midway is Negra point, fronted by a reef 2 miles in length, and extending half a mile from the shore; and 1¼ miles north-west of the point there is a small village and a group of cocoa-nut trees, off which, under shelter of the point, there is anchorage for small craft with southerly winds.

Rio Pirangi.—Between Negra and Cotovello points there are some red cliffs, named Barreiras do Inferno; and between Cotovello

* Navigating Sub-Lieutenant C. H. Stewart-Douglas, H.M.S. *Dart*, 1872.

point and Busios point at 1½ miles south of it, lies the Rio Pirangi, with a village on either side of the entrance. From abreast Cotovello point, a reef covered at times, and having several shoals inside it, extends nearly 6 miles in a southerly direction, parallel with the shore. There is anchorage inside the reef, off the village north of the river, in 3½ fathoms water. At one mile eastward of the north end of the reef there are depths of 6 to 8 fathoms.

The Coast.—From Busios point the coast trends to the southward for 16 miles to Moleque point: and about 9 miles farther on is the bay and town of Formosa. At 7 miles southward of Busios point is the little river Camoropim or Trahiry, with the point and village of Tabatinga 2 miles north of it.

Ponta da Pipa.—At the distance of 5 miles southward of the Camoropim river in the bend of the coast, are a few houses with a group of cocoa-nut trees; and 4 miles to the southward, or one mile north-west of Moleque point, is Pipa point and village. Off this point is a detached rock resembling a wine pipe on its end, from which it takes its name, and is the only remarkable point on this part of the coast.

Temporary anchorage will be found north-east of point Pipa village, but at about one mile off the point is a shoal about half a mile in extent with 2½ fathoms water on it.

Rio Cunhahu.—From Moleque point the shore trends to the southward for nearly 5 miles to the mouth of the Rio Cunhahu, with the hill of the same name on its south bank, and a village just within the entrance on its north bank. The river is entered through a break in the reef on the north side of its entrance, having 14 feet at low water. Both entrance points are bordered by sand-banks. The river has 11 feet water at 5 miles within its mouth. Close north of Cunhahu river is Sibahuma hill, 328 feet in height, and between it and Moleque point is the river Sibahuma.

For nearly 3 miles north and south of the Cunhahu it is skirted by the recife at about half a mile off, and which at times uncovers.

FORMOSA (FAIR) BAY.*—From Cunhahu river the shore trends south for 3½ miles, and then eastward 1½ miles to cape Bacopary, forming Formosa bay. The town of Formosa stands on the north-east face of the cape.

* *See* Admiralty chart:—Formosa to Pernambuco, No. 820, scale, *m* = 0·4 of an inch.

Anchorage.—The bay affords shelter from southerly winds, in 4 to 5½ fathoms.

The COAST.—From Formosa bay to as far south as Traiçaó bay a distance of about 18 miles, the shore presents a continuous line of white sandy downs, covered at intervals with bushes; it is skirted more or less by the recife, from a half to one mile from the shore, and which is occasionally uncovered. Between are the mouths of the rivers Guaju and Camaratuba, the latter about 6 miles northward of Traiçaó point, with the village of the same name standing on the north part of entrance. Between these rivers and near the coast, is mount Pelé, 426 feet in height.

TRAIÇAÓ (TREASON) BAY, is formed by the point of the same name, which extends eastward more than a mile. A village stands in the bay, backed by cocoa-nut trees. A shoal lies in the south side of the bay with one to 2 fathoms water inside it. The out-lying reef, which is uncovered, passes half a mile eastward of Traiçaó point, and extends northward more than a mile, leaving a space of about 1½ miles wide between its termination, and the shoals at the distance of half a mile off Tamba red cliff to the northward.

In the middle of the entrance, between the north end of the reef and the shore, is a shoal which is steep-to, and may be passed on either side. The anchorage, fit only for coasters, is close inside the north end of the recife in 2½ fathoms water.

Acemtibiro lake is 5 miles in length, and narrow, with 4 feet to 14 feet of water. It is separated from Traiçaó bay by a narrow neck of land north of the village. A narrow passage between Coquerinho point and the islets southward of it at 3 miles south of Traiçaó, leads into the lake. The village and church of San Miguel stand on its western side.

The COAST.—At about 4 miles southward of Traiçaó point is the mouth of the river Mamanguápe, and 8½ miles further south is Lucena point. Between the latter are three conspicuous high red cliffs, named Barreiras de Miriri, which may be seen at the distance of 20 miles, and assist in identifying the entrance to Parahiba river, which is about 7 miles to the southward. From Traiçaó point, the recife, or off-lying reef, more or less uncovered, trends to the southward, covering the mouth of the Mamanguápe, and passes close to the south point of its entrance, terminating at 1½ miles to the southward; it recommences about 3 miles northward of Lucena point.

MAMANGUÁPE RIVER is navigable for small coasters, which collect the produce of the northern parts of Parahiba for conveyance to Pernambuco. The southern entrance point of the river is low, sandy, and projects to the north-east, having a village and several cocoa-nut trees along its north side. Coquerinho (the southern extremity of the peninsula of Traiçaó) with the village of the same name is 1½ miles to the northward, from whence the shore trends to the west for about a mile to the entrance of a narrow passage leading into Acemtibiro lake.

Between the south side of Coquerinho point and that of Mamanguápe are several islets and shoals leaving a channel along by the south shore into the river, the bar or entrance to which, is through a narrow break in the reef northward of Mamanguápe point. The channel inside and along the reef, carries from 1½ to 7½ fathoms water; between the shoals and the south shore the depth is about one fathom, but farther in the water in places deepens to 2½ fathoms.

LUCENA POINT, at 3 miles northward of the entrance to the Parahiba river, projects seaward with a village stretching along its north side for nearly a mile, backed bv cocoa-nut trees.

Lucena point is fronted by a shoal, named the Baixos de Lucena, on which the sea breaks, it extends 3 miles N. by E. ½ E. from that point and nearly the same distance from the shore; thence to the southward for upwards of 4 miles, passing 1½ miles eastward of the point. At one mile from the breakers there are 5½ to 7 fathoms water.

PARAHIBA RIVER* falls into the sea in lat. 6° 57′ S., long 34° 50′ W. From off cape Branco, 12 miles southward of the entrance, the country to the northward appears like two plains, which on closing becomes distinctly marked. The outer plain by the sea is low and sandy, but woody on its highest part; the inner one presents a series of small woody hills of a pleasing appearance. The river runs between these two plains in a north-north-east direction.

Matto point, on the south side of the entrance, is low and woody, and is the extremity of the outer plain; just inside it is Barra fort, which may be seen from the offing when bearing to the southward of West. At three-quarters of a mile west of the fort is the opposite point of entrance, formed by the second plain; it is more elevated

* *See* Admiralty plan :—Parahiba entrance, No. 1,396; scale, *m* = 4·0 inches.

than Matto point, and on it are some cocoa-nut trees. Nearly 1½ miles to the north-west is some high wooded land, on which stands the conspicuous convent of Nossa Senhora da Guia.

Extensive breakers indicate the entrance to the river, caused by the reefs surrounding it, and the shoals stretching eastward from Lucena point. A white buoy with flag is moored on the outer edge of the bar, at about three-quarters of a mile north-west of the lighthouse.

About 17 feet can be carried over the bar at low water, but from the constant shifting of the sands it is necessary to employ a pilot. Vessels drawing 15 feet anchor off the town of Parahiba, but they ground there at low water. Larger vessels anchor just within the entrance of the river, off Cabedello village in 4 or 4½ fathoms.

Pier.—At Cabedello there is a large solid pier, alongside which vessels can lie in 26 feet or 27 feet at low water.

Sidings connect the head of the pier with the terminal railway station in the town, so that trucks can be brought alongside the vessels; loading and discharging can be carried on from both sides of the pier simultaneously. A travelling crane is available, and vessels are in smooth water at all times.

Facilities for coaling might be afforded if arrangements were made.

Town.—The town of Parahiba, and capital of the province stands on the right bank of the river about 12 miles from the entrance. The most important public buildings are—an old college, now the governor's residence, house of assembly, courts of law, custom-house, town-hall, numerous churches and convents, an hospital, and barracks. There is also a college and elementary schools. Population about 17,000.

During the year 1888, the number of sailing vessels that entered the port amounted to 37, with a tonnage of 14,175; steam vessels 8, with a tonnage of 7,570; number of sailing vessels cleared 40, tonnage 15,131; steam vessels 8, tonnage 7,570.

The exports consist of cotton, sugar, rum, woods, hides, gums, oils, and various other articles, amounting in 1888 to £197,063. There is steam communication from this port to Pernambuco, and other ports in Brazil.

Supplies.—Fresh beef and other supplies may be obtained at a reasonable price, but vegetables are scarce. Water can be procured a little above the town from a well near the river bank.

LIGHT.—From a lighthouse painted red, with narrow white stripes, erected on Pedra Secca rocks, the northern extremity of the off-lying reef, is exhibited, at an elevation of 52 feet above high water, a revolving white light *every minute*, and should be visible in clear weather 12 miles; from a distance the lighthouse appears red.

Pilots will come off, on making the usual signals; they are expert and trustworthy, and live at Cabedello village south of the fort. A river pilot will conduct the vessel up the river, which is generally done in one tide; but, in leaving, sailing vessels have nearly always to work out, there being little or no land wind.

Tides.—It is high water, full and change, at Barra fort, at 5h. 0m.; springs rise 8 feet; neaps 5½ feet.

Directions.—To the northward of the Parahiba there are three conspicuous red cliffs, which a stranger will probably find the best mark to indicate his approach to this river, prior to the lighthouse being seen. On account of the prevailing current (page) vessels should endeavour to make cape Branco, and soon afterwards the convent of Nossa Senhora da Guia, a large dark looking building, will be seen surrounded by trees, and apparently half way up the incline of the hill on the north side of the river. When Barra fort is sighted bearing about West, heave-to for a pilot. At the distance of 3 miles from the recife there is a depth of about 7 fathoms water.

TAMBAHÚ.—About 6½ miles southward of Matto point is the village of Tambahú, having a road leading to Parahiba, distant 4 miles. Little or no trade is carried on here beyond building the large jangadas used on the coast as passenger boats. Off the village there is convenient anchorage for vessels wishing to communicate with Parahiba without going up the river. Tambahú will be seen at a distance, with the steeples of Parahiba appearing over the hill at the back of the village.

Anchorage.—Bring the steeples of Parahiba to bear West, run in, and anchor as convenient. A berth will be found in 5 fathoms water, a mile from the recife, with cape Branco bearing S.S.W. ¾ W.,

and the centre of a group of cocoa-nut trees in the village West. There is no danger, and from a distance of 8 miles the soundings gradually decrease from 10 to 5 fathoms nearer the shore.

CAPE BRANCO.—From Matto point, Parahiba, the low woody shore trends southward for 12 miles to cape Branco, a well-wooded cliffy point of white sand, about 98 feet high, conspicuous when north or south of it, but blending with the land when seen from the offing. There are several cocoa-nut trees on its summit, and a little southward of it is the chapel of Senhora da Peñha. The recife, more or less uncovered and broken, skirts the shore at the distance of half a mile to a mile, with several shoals inside it and small channels between, having 1½ to 2¾ fathoms water. At 3 miles eastward of the cape there are 6 fathoms water, sand, ooze, and coral.

The COAST from Cape Branco trends in a southerly direction for a distance of about 20 miles to Coqueiros or Guia point, which will be known by its being salient or projecting seaward, whilst that of Petimbú, north of it, is steep. At 9 miles south of Coqueiros is Piedras point, with the Goiana river between, and 4½ beyond Piedras is Catuáma bar, at the north end of the island of Itamaracá. The coast all along presents sandy beaches, now and then intercepted by perpendicular red cliffs, from 20 to 60 feet high, and the mouths of several small rivers. It continues to be skirted by the recife, but which is much broken from cape Branco southward, and in many places disappears.

Near the Rio Abiahy, the recife rises after some interval, again becomes more regular, and is uncovered at times; northward of its re-commencement there is indifferent anchorage with southerly winds. From this part of the recife to as far south as Goiana bar, it is bordered by banks at a distance of about one mile, having over them from 2 to 2¾ fathoms water; and off the Goiana river the off-lying reef is 3 miles from the shore. Inside the recife there are numerous banks, which renders the navigation impracticable to any but small coasters having local knowledge.

To the northward of Piedras point is mount Almescar, which is isolated; more to the southward is that of Itapessóca, with a large quantity of cocoa-nut trees at its northern extremity; and south of it is mount Campiro, on which there are also cocoa-nut trees, with an isolated one in the centre; and between the two mounts a deep valley.

PETIMBÚ or PORT FRANCEZ, between Petimbú and Coqueiros or Guia point, has room for a few small vessels; the greater part of the space inside the reef is encumbered with sand-banks, and the bottom indifferent. From a depth of 3 fathoms at the entrance, the soundings diminish to one fathom, coarse sand, near the beach; outside this latter depth the bottom is soft mud, and near the recife there are 3 fathoms coarse gravel and stones.*

The entrance to the port is through an opening in the reef, about 43 yards in breadth, with 4 and 3 fathoms water, over fine sand. The reef which borders the entrance has from 2 to 3 feet water over it. At a little distance from the reef on the north side are seen two heads of rocks which uncover at low water spring tides. During summer, port Francez affords good shelter for coasters; but in the winter, as the recife is uncovered but little, and that only at the time of spring tides, the south-east winds which blow during this season cause much sea. The village of Petimbú with its church stands in the bay.

Les Tacis reef.—Eastward of the recife which borders Coqueiros point at the distance of 2 miles, is the rocky bank named les Tacis, which extends in a southerly direction from the entrance to port Francez, parallel to the recife for a distance of about 3 miles, and as much as one mile seaward of it, with depths of from 10 to 16 feet. The recife north of the entrance is bordered by a similar bank extending about half a mile.

Directions.—Port Francez will be readily known by a steep rocky well defined coast from 25 to 30 feet high near Petimbú, and from the land to the northward near the mouth of the river Abiahy being lower. Coqueiros or Guia point has a large plantation of cocoa-nut trees on it. When the southern extremity of the high part of the rocky shore in the middle of the bay bears W. b. S., and the rocky shore north of it N.W. b. W., a vessel will be in the fair way of the entrance; then steer W.S.W. until past the southern reef, when alter course to S.W., and when the church bears N.W. steer for it, and anchor in about 2½ fathoms, muddy bottom. Nearer the shore the bottom is coarse sand, and near the recife gravel and stones.

* The position of port Francez is somewhat doubtful, the directions, originally from the Brazilians, not agreeing with the chart by M. Mouchez. The port, erroneously called such, is simply a shelter behind the recife, and only fit for small coasting craft, with local knowledge. This applies to similar small ports and river entrances on this portion of the coast.

GOIANA RIVER.—The mouth of this river, in lat. 7° 33′ S., long. 34° 49′ W. is 1½ cables wide, having from 2¼ to 3 fathoms water. The river is winding and falls rapidly, but is navigable for small vessels for about 10 miles, where there is 6 feet water. The town of Goiana is about 12 miles from the sea, and here the river trends northward for 9 miles farther. It receives the Tracunhaem from the south-west, and the Jacaré or Capibaribe-merim from the north-west.

The entrance is approached through a break in the recife, from 30 to 35 yards wide, with a depth of 1½ to 2 fathoms at low water springs. The reef to the northward uncovers at a quarter ebb and shows several heads of rocks; that on the south is uncovered about 3 feet at low water springs. The channel between the banks inside the recife leading to the anchorage has about 2¾ fathoms water, over sand and gravel.

Directions. –Vessels bound for the bar of Goiana from the northward, should make Coqueiros point, and steer to the southward until Guagirú point, which is sandy and covered with cocoa-nut trees at the north side of the river, is seen, and which will also be known by some mangrove trees separated in the middle, farther south.

Keep an isolated tree on mount Selleiro open of Piedras point until the mouth of the river is seen; the fairway of the bar lies with Guagirú point bearing W. by N., and which may be steered for on that bearing; from a depth of 1½ fathoms at low water on the bar, it deepens to 2¾ fathoms inside the recife, where a little to the north there is anchorage over sand and gravel. In proceeding for the mouth of the Goiana, steer about S.W. by W. between the banks for about 2 miles, or until Guagirú point bears N.W. by N., when a N.W. course will lead between the banks to the anchorage, which is near Guagirú point in 2½ fathoms, coarse sand.

In coming from the southward, a vessel should make and pass 3 miles eastward of Pedras point to avoid the reefs extending nearly that distance, until Guagirú point is seen. When approaching the entrance, the tree on mount Selleiro should be kept open, and then proceed as in coming from the northward.

This and other small rivers along the coast are only available for coasters, and with local knowledge.

Rio Megaho.—The mouth of this small river leading to the lake of Tejucupápo, lies about one mile southward of Goiana and within the bar of that river. It is about 140 yards in breadth, which it

preserves for about three-quarters of a mile; it has 2¼ fathoms at its mouth, and is navigable for small craft to 4½ miles from the entrance, when the depth decreases to about 3 feet.

PIEDRAS POINT* is conspicuous, with a village and church on its south side. At 4 miles south-west of it is Funil point, near which is the village and anchorage of Catuáma. Between the two points the reef and sand-banks extend off shore, a distance of 3 miles.

Gerimum bar.—At the distance of 2 miles S.S.E. from Piedras point is the small bar of Gerimum formed by a break in the reef northward of Catuáma bar; it is more than a cable in breadth, with 3 to 4 fathoms water, over coarse sand. The reef on the north side of the entrance has about 10 feet over it a low water; that on the south has about 7 feet over it, and extends with a chain of rocks in a W. by N. direction. Within the entrance there is good anchorage in 2¼ to 2¾ fathoms water, coarse sand; but the space is narrow and the shore should not be approached too near, as it shoals suddenly. The narrow channel between the banks leads to an inner anchorage named Poço.

The space between the recife and the coast from Piedras point to that of Funil, is filled with banks, leaving a narrow channel between them and the recife, with one to 2¼ fathoms water, which leads to Catuáma bar. The bank outside the recife, which here terminates, leaves a clear space south of it, and near which there are from 5½ to 6½ fathoms water.

To cross Gerimum bar, proceed as for that of Catuáma and steer to the north-north-eastward along the edge of the barrier reef, in 5 to 4 fathoms water. When the highest part of Itamaracá is in line with the middle of the hill of Jaguaribe, which resembles a bowl, and the cocoa-nut trees near Catuáma are on with those of mount Carrapixo, steer W. by N. for the middle of the bar, which lies with Piedras point bearing N. by W., and Funil point West.

CATUÁMA BAR.—At the northern extremity of the island of Itamaracá, is Catuáma bar and channel, formed by the coast trending westward and southward around the island, and by the reefs stretching from the island and shore for a distance of 3 miles to seaward.

* The steam-vessel *Harold Haafgar* passed, on 22nd April 1887, when about 10 miles off Piedras point, and about 35 miles north-eastward of Pernambuco, the sunken wreck of a steam-vessel, in about 15 fathoms, and with two masts showing above water. Position, as given, lat. 7° 34′ S., long. 34° 36′ W.

The channel leads to the river Tejucupápo and others on the main, and through the arm of the sea about half a mile in breadth, which separates the island from the mainland, passing out at Ilha bar. The channel between the banks leading from the bar to the anchorage is rather narrow, with 2 to 4 fathoms water, sandy bottom.

Anchorage.—The anchorage at Catuáma occupies a space of 1½ miles in length, and about one-third of a mile in breadth, north and south; and lies between Funil and Atapuz points on the main, with depths of 3½ to 5½ fathoms over coarse sand; near Funil and Selleiro points the bottom is mud and gravel.

Within the entrance reef on the northern side is a rock named Gostoso, with 10 feet water over it, which may be avoided by keeping Funil point northward of a N.W. by W. ½ W. bearing. Outside and near the reef on south side of entrance, is Jaguaribe rock with 2¼ fathoms water over it. There is also another rock near Funil point which uncovers with the banks forming the channel, at certain states of the tide.

Directions.—The position of the bar of Catuáma will be known by mounts Funil and Selleiro, on which there are some cocoa-nut trees. In approaching it keep at a convenient distance from the recife, and with mount Funil bearing N.W., it may be steered for until Pilar point bears S.W. by S. In this position a vessel will be on the bar, with a depth of about 13 feet, and about 100 yards from the north and south points of the reef which never uncover. From thence, the course is W.N.W. for one mile, thence S.W. by W. ¾ W. the same distance, and when Piedras point bears North the course will be west, and then as requisite to pass about 2 cables northward of the north-east point of Itamaraca island, to the anchorage.

The banks on each side of the channel to the anchorage are uncovered at half tide, and on which the sea breaks at high water. The least depth is about 1¾ fathoms, but within the line of Pedras and Pilar points it increases. The channel is narrow and the rocks previously mentioned must be avoided. Local knowledge is indispensable.

Rio Macarandúba (Itapeçoca).—This little river opens between Funil and Selleiro points northward of the anchorage of Catuáma. Its mouth is narrowed by some rocks, beyond which it widens to 260 yards. It has from 3½ to 4 fathoms at low water, over sand and mud, and is navigable for large boats.

Rio Tejucupapo.—The mouth of this small river, 328 yards in width, which it preserves for a distance of 6 miles, with depths of 3 fathoms, at first sand and then mud, is formed between Selleiro and Atapuz points westward of Catuáma anchorage. It leads to the village of the same name at 9 miles up, and to port Ilhota.

ITAMARACA ISLAND.—The shore of this island, 8 miles north and south, is in line with the main land; it is planted with cocoa-nut trees, among which are whitewashed dwellings and the cottages of fishermen. The island produces cotton, sugar, and rum; there are also extensive salt-works formed on the sand, which are overflowed at high water. At the north end of the island is Catuáma channel, which leads to the anchorage of the same name. At 2 miles southward of the mouth of the Jaquaribe at the north end of Itamaracá, is the village of Pilar; farther to the southward is that of Bom Jesus; and at the south-east extreme of the island is a fort.

The small river Jaquaribe is important from its commerce in salt, procured from the extensive salt-works on the east side of the island and which commences at about one mile within the entrance. It is narrow, runs to the southward for about 3½ miles, and carries from one to 3½ fathoms water, with several holes or wells.

The south point of Itamaracá island terminates in a tongue of sand which extends in an E.N.E. direction for about half a mile, and joins the extensive bank named Macaco, fronting this end of the island. The recife fronts the island at a distance of about 1½ miles, and uncovers at low water from Catuáma bar to some distance southward of Pilar village, when it becomes covered, and continues so until southward of Ilha bar.

The rocky bank, with 2 and 3 fathoms water on it, continues to border the recife at a distance of about 2½ miles from the land, and terminates at the north side of Ilha bar.

An isolated bank, one mile long, with a depth of 1½ fathoms, lies on this southern edge, with the fort bearing W. by S. ¾ S. distant 3 miles; between this bank and the recife there is a depth of 3 to 4 fathoms, from thence to the island the space is obstructed by sand-banks.

Ilha bar.—This bar, a little northward of the parallel of Fortoleza fort at the south end of Itamaracá, is about 16 miles from Pernambuco. Its position may be recognized by Silleiro and Funil hills to the

northward, and by the fort at the entrance, which may be seen from 6 to 8 miles. The entrance is more than half a mile wide with 7 fathoms water outside, and 4½ fathoms water between the entrance points of the reef, over coarse sand. On the south side of entrance the recife uncovers, and a little northward of it is a depth of 7 feet at low water; on the northern reef there is 10 feet.

Within the reef on the south side is a shoal of coarse gravel and stones, which renders it necessary to keep on the north side of the entrance. Within the northern reef there is a chain of rocks in a north and south direction, which uncover, leaving between them and the recife a passage with 7 feet water, leading to the channel of Poço, where small coasters may obtain anchorage.

The channel inside the bar is formed by banks of sand on either side; it leads to the anchorage of the port of the island, and carries from 2¾ to 3½ fathoms water, over sand, but it is narrow and there is not room for any vessel to work out; the deepest water is on the south side. The navigation is easy, as the sea breaks on the banks at high water, and at a quarter ebb they uncover and show the limits of the channel. The soundings from abreast the fort to Itapiçuma village are from 3 to 3¾ fathoms, and at the south-west end of the island the depth is 2½ fathoms, with 3 fathoms near the main, sand and mud. The rise of tide at springs is said to be about 9 feet.

Anchorage.—There is good anchorage from a half to one mile westward of the fort, and eastward of the village, in 3½ to 4 fathoms; small craft can continue on to Itapiçuma.

Directions.—With the fort bearing W. ¼ S., distant 3 miles, and Pilar point N. by W. ¾ W., there is a depth of 4¾ fathoms; thence a course W. by N., one mile (or until Pilar point is in line with mount Silleiro), leads close northward of the southern reef, thence a course W. by S. ¼ S. will lead about mid-channel between the sand-banks.

The channel or arm of the sea, which separates Itamaracá island from the mainland, is navigable for small vessels. In the northern part, it is narrowed by two mud islets which lie in the middle, with a space on either side of about 1½ cables in breadth. The greatest depth is on the island side, where there are from 2¾ to 5½ fathoms. At the south end of the islets is the mouth of the Rio Araripe, fronted by a hole or well 5½ fathoms deep, mud bottom. It is more than 6 miles in length, and about 260 yards wide at its

mouth, and is navigable for 3 miles, with 3½ to 3 fathoms water at that distance up, thence the depths decrease towards its head.

Southward of the Araripe is that of the Rio Congo or Tomba-as-Aguas, nearly 3 cables wide at low water, but much broader at high tides. It is navigable for small vessels for a distance of 1½ miles, and at its mouth it is 218 yards wide, with 2 fathoms at low water.

Southward of the Congo for a distance of more than a mile the depths in the channel gradually decrease to about one fathom, here the tides from Catuáma and Ilha bar meet, which no doubt is the cause of the accumulation of sand. At about 3½ miles southward of the Congo stands the church dedicated to St. Gonsalo, and the village of Itapiçuma, where there is a considerable trade in sugar.

It was proposed to construct a bridge here to connect the island, which is distant about 968 yards, the depth of water being nearly 3 fathoms, over mud. The width of the channel at low water is only 430 yards. The village, extending about a mile north and south, stands on a low plain. The channel, having about the same depths, continues to the southward for 1½ miles to a place named Marcos; here it forms an elbow and turns to the eastward towards Ilha bar The mouth of the Iguaraçu river is narrow and lies on the main nearly opposite the ancient village of the island of Itamaracá. It is navigable for small vessels for a distance of 2 miles, carrying from one to 2 fathoms water; beyond which it is encumbered with shoals. At 4½ miles from the sea is the town of the same name.

Rio Maria Farinha, about 2 miles southward of Itamaracá island, trends to the south and south-west for a distance of 3 miles, carrying from 1½ to 4 fathoms water; when it divides into two branches, the Maria Farinha continuing to the southward, and the Inhaman, the other branch, trending westward. The Maria Farinha is about 195 yards wide at its mouth, and has a considerable trade in white chalk, which employs a large number of boats.

The bar, formed by a small opening in the recife, lies 1½ miles S. by W. from Ilha bar. The narrow channel, running about W. ¾ N. from the bar, and carrying from 9 to 3 feet to the entrance of the Rio Farinha, is formed by sand-banks on either side. There is also a narrow passage between the recife and a ridge of rocks inside and parallel to it, having from one to 1½ fathoms water over coarse gravel, which leads to the channel from Ilha bar.

The mouth of the river will be known by its south point of entrance being sandy, a little elevated, covered with cocoa-nut trees, and well detached from the opposite shore, which is high and continues so to Ramalho, the point south of Itamaracá. At a little more than 2 miles southward of the bar of Maria Farinha is that of San José, the space between inside the recife is filled with banks, some of which are uncovered.

San José bar.—The position of San José will be recognised by the three churches in the locality; that of Conceiçaõ near the shore; San José on the higher land; and the convent of San Bento on a hill of the same name more in the interior. The recife between Ilha bar and that of St. José is fronted at the distance of a mile by a rocky bank, with 2 to 3 fathoms water 4 fathoms inside, and 6 to 7 fathoms at half a mile outside.

San José anchorage is formed by the points of Maria Farinha and Leitao, the latter nearly half a mile S.S.E. of the church of Conceiçaõ. The recife, which passes at a distance of nearly 2 miles, has an opening about 38 yards wide with nearly 4 fathoms water, between the two heads of rock, which diminishes to about one fathom at three-quarters of a mile from the shore. The recife being low, winds from E.N.E to E.S.E. cause a heavy sea, rendering the anchorage here much exposed.

The bar lies with the church of Conceiçaõ bearing W. by S. ¼ S., and the fort at the south end of Itamaracá N.W. by N. From the rocky heads on the south side of entrance, a chain of rocks partly uncovered extends in a S.W. by W. direction towards the shore. In running along the land at the distance of 4 miles for the bar of San José, the forts of Pau Amarello and Itamaracá will be first seen, then the different churches. Care should be taken to pass the bar nearer the rocks on the north side of entrance than those on the south.

The COAST.—From Itamaracá to the southward the coast is composed of low cultivated woody hills with cocoa-nut trees and several villages. From fort Pau Amarello southward to Olinda, the land increases in height. The shore presents a sandy beach, and from the north end of Itamaracá, it may be said no part of it is free from breakers, although interrupted in places. At 2 or 3 miles from the recife there are from 10 to 14 fathoms, sand and gravel.

At 4 miles southward of the fortress at the south-east end of Itamaracá is Leitao point, with a church about half a mile south of it;

and 2 miles beyond the point is fort Pau Amarello. About 2 miles south of the fort is Quadra point, forming a little bay between, with the chapel of Conceiçaõ do Medio about one mile from the coast. At one mile from Quadra point is the mouth of the Rio Doce, with a chapel south of it, and at nearly 4 miles farther on is Olinda point, with the Rio Tapado 1½ miles to the northward.

The recife, which is uncovered as far south as Quadra point, there becomes covered, more broken, and runs to the southward, having from 7 to 20 feet water on it. The bank continues to border the recife at about 1½ miles from the coast, extending south-east of Olinda to a distance of 2 miles.

The space between the coast and the recife has depths of from one to 4 fathoms, coarse sand; but as the recife has so much water on it, there is here a heavy sea caused by the swell from the offing. There are two or three patches of rocks nearly midway between the coast and the recife, extending from a little northward of the Rio Doce for 1¼ miles to the southward, with about 6 to 9 feet water on them.

Fort do Pau Amarello or Yellow-wood, is known by a break in the land, which looks like the entrance to a large harbour. Coasters of 6 or 7 feet draught can cross the bar at high water, and pass inside Olinda reef and banks to Pernambuco.

Rio Doce, in lat. 7° 57′ S., long. 34° 50′ W., is only navigable for small coasting vessels. The mouth of this river, which is encumbered with sand-banks, is about 16 yards wide.

Pau Amarello bar lies with the fort bearing W.S.W. It is narrower and not so deep as that of San José; but the recife is here higher and the anchorage inside is more sheltered. Between the entrance reefs there is a depth of 4 fathoms, sandy bottom. Inside, the water shoals and it is encumbered with banks. Within the southern reef there is anchorage in 2 to 3 fathoms, coarse sand and gravel, between Rapa bank, having about one foot water on it, and the recife. The space is limited, there is not room to swing, and it is necessary to make fast to the recife.

The fort of Pau Amarello, with the convent of San Bento on the hill to the north-west of it, are good marks for the bar. At the distance of 4 miles from the shore, bring the fort to bear W.S.W. and steer for it; when Maria Farinha point bears N. by W. ½ W. a vessel will be at the middle of the bar, and having passed it, may anchor

inside in 2 or 3 fathoms water, keeping Olinda point open; or more shelter will be found to the southward between Rapa bank and the recife. Coasters of light draught with a fair wind may pass between Rapa bank and that inside of it.

OLINDA POINT.—The town of Olinda stands a little south of the point on the most elevated land in the vicinity of Pernambuco, and is remarkable from its white houses and churches, interspersed with trees. Northward of Olinda the land is moderately high, nearly level, and covered with brushwood. The point is bordered by extensive reefs, with breakers, stretching seaward nearly 2 miles. The shore from thence curves to the south-westward for about 2½ miles to fort Bruno, at the entrance to Pernambuco.

LIGHT.—On the old fort of Montenegro on Olinda point is exhibited an *occulting* white light, giving alternate flashes of *thirty*, and *three* seconds, with eclipses of *five seconds*, visible in clear weather from a distance of 18 miles.

Buoy.—A white buoy lies in 5 fathoms off Olinda reef, at 12 cables S. ¼ E. from Olinda lighthouse, and in clear weather may be seen from a distance of 5 or 6 miles, but its position is not to be depended on.

PERNAMBUCO,* the capital and principal seaport in the province of the same name, is situated at the mouth of the river Beberibe, in lat. 8° 4′ S., long. 34° 52′ W. It stands on a flat, and is divided into three parts, occupying respectively a peninsula, an island, and the continent. Recife, or Pernambuco proper, is built on the peninsula formed by the Rio Beberibe, which extends southward from Olinda, and is the most mercantile part of the city. Santo Antonio stands upon an island or sand-bank, formed by the arms of the Beberibe, and connected with Recife by a long stone bridge. The third division of the city, named Boa Vista, is on the main land westward of Santo Antonio, and joined to it by a wooden bridge.

The population of Pernambuco and its environs is about 120,000. Its commerce is important, the exports consisting chiefly of cotton, sugar, rum, hides, and dye-woods; and the imports of cotton and linen cloths, hardware, cutlery, silks, wine, flour, salt fish, &c.

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* *See* Admiralty charts:—Pernambuco to Victoria, No. 529, scale, $m = 0{\cdot}05$ of an inch; Pernambuco to Maceió, No. 891, scale, $m = 0{\cdot}4$ of an inch; and plans of Pernambuco roads and harbour, No. 969, scales, $m = 4{\cdot}8$ and $9{\cdot}6$ inches.

During the year 1888, the number of sailing vessels of all nationalities that entered the port amounted to 519, with a tonnage 185,246; and steam vessels 501, tonnage 710,594. The total value of the imports was 3,023,317*l.*, and of the exports 1,416,787*l.*

Communication.—Pernambuco is connected by telegraph with the principal ports in Brazil, and by submarine cable with cape de Verde islands, Madeira and Lisbon. Several lines of mail steamers, including the Pacific Steam Navigation Company and Royal Mail Company, call here.

THE RECIFE, or reef in front of Pernambuco, which forms the harbour, extends along the shore from Boa Viagem point, and terminates abreast fort Bruno which stands on the peninsula, and commands the entrance to the harbour. Near the extremity of the reef is a small octagonal fort named Picão, and 50 yards northward of the fort is the lighthouse. From the extremity of the recife, shoal water—interspersed with patches of rocks which have a depth of 6 feet—extends from the lighthouse nearly half a mile in a N.E. by N. direction.

Buoys.—A buoy, painted black, marks the extremity of the shoal water extending from the lighthouse, also the south side of the Great passage. A buoy, named Cabeca de Coco, painted red, marks the southern extremity of a shoal which breaks at low water, off fort Buraco, on the north side of the Great passage. Two red buoys mark the direction of the telegraph cables. The spare telegraph cables of the Western Brazilian Telegraph Company are marked by a buoy in lat. 8° 6′ S., long. 34° 49′ W., and another buoy S. 10° W. 15 miles from it.

THE GREAT PASSAGE, leading into the harbour, is northward of the shoal extending from the lighthouse, and has a depth of 3¾ fathoms at low water.

The Poco, or well, which forms a part of the Great passage into the harbour, has a depth of 20 to 24 feet shoaling towards the shore, and is partially protected by the shoal extending N.E. by N. from the lighthouse. Here vessels of more than 13 feet draught lighten to go inside, and also take in the last part of their cargoes.

Picão passage.—Close northward of the lighthouse is Tartaruga rock, steep-to, which forms the south side of the Picão or little passage. Steer in with the two south turrets of fort Bruno in line, and haul close round Tartaruga rock and along the Recife until a cable's length from the lower tier of shipping, then anchor and wait for orders from the harbour-master.

Harbour.—Vessels lie sheltered in the harbour of Pernambuco four and often six in a tier, and moored parallel to the Recife. The water is nearly always smooth, except at high water springs, when the sea runs over the Recife, causing a swell, and with strong sea breezes the vessels roll and strain considerably, but this lasts only for about two hours at each high water springs. Vessels drawing 19 feet can enter the harbour at high tide, and the telegraph ship *Norseman*, drawing 21 feet, entered without accident, at high water springs.

Supplies.—All kinds of supplies are to be obtained at Pernambuco.

Coal.—From 3,000 to 6,000 tons of coal are kept in stock: vessels in the harbour may be coaled at the rate of about 450 tons per day, and in the road by lighters at the rate of 150 tons. The roadstead is not a desirable place to coal from or to remain in longer than necessary, especially at the change of the monsoons.

English bank, with 16 feet over it at low water, and on which the sea breaks heavily with a south-east wind, lies N. by E. and S. by W., and within the depth of 3 fathoms is one-third of a mile in length and a quarter of a mile in breadth. From the centre of the bank the lighthouse bears about West 8 cables distant.

At a quarter of a mile eastward of the south end of English bank is a patch of 3½ fathoms.

Buoys.—The English bank is marked by two buoys; namely, one on the north end painted red and white vertical stripes, and one on the south end painted red; the five-fathom edge of the bank extends about 2 cables north and south respectively of the buoys.

To pass northward of the bank keep the highest church in Boã Vista open to the northward of the lighthouse. The southern turrets of fort Bruno shut in or open south of the lighthouse, lead to the southward of the bank. Between the bank and the reef extending north of fort Picão is a channel half a mile wide, with 5 fathoms water. The pilots state that this bank is increasing.

Vettor Pisani shoal.—A shoal having a depth of 4 fathoms, rocky bottom, has recently been found in the outer road during an examination made by the officers of the Italian corvette *Vettor Pisani*. From the centre of the shoal, which is apparently of small extent, Olinda lighthouse bears N. ¼ E., and Picão lighthouse W. by N., distant about 1¾ miles.

Fort Picão, in line with fort Bruno, leads nearly 4 cables south of the shoal, which should be avoided when there is a heavy sea.

Ituba shoal.—This shoal, also reported by the *Vettor Pisani*, has 3¾ fathoms water, and lies with Olinda lighthouse bearing N. by E. ¼ E., Picão lighthouse N. by W. ½ W., and Lazaretto or Quarantine house W. ½ N.

About 8 cables S.W. of Ituba shoal there is a similar shoal of 4 fathoms.

Afogados bank.—At about 1¼ miles southward of the lighthouse, a rocky bank of 3 fathoms and less, named Afogados, extends nearly three-quarters of a mile from the shore; thence it trends southward parallel to Pernambuco reef.

LIGHT.—On the extremity of the reef at 50 yards northward of fort Picão, on a rock covered at quarter flood, stands a white octagonal tower, which exhibits a *revolving* light, showing *twice* a white face and *once* a *red* face, alternately *every minute*, separated by eclipses of *five seconds*; but is reported to be irregular in its action. The light should be seen in clear weather from a distance of 15 miles.

Pilots.—Vessels visiting Pernambuco with the intention of going into the harbour will find it preferable to keep under way, standing off and on, guarding against the current. By the regulations of the port all vessels going into the harbour are obliged to take pilots; they are generally in waiting, and are furnished by the Government. A harbour launch and crew are provided, if necessary, which when employed must be paid for in addition to the pilotage. Application is made for pilots at the arsenal.

Tides.—It is high water, full and change, at Pernambuco, at 4h. 45m.; springs rise 8 and neaps 6 feet.

Anchorage.—Vessels may anchor anywhere southward of the south buoy on English bank, giving it sufficient room, in 6 of 7 fathoms water, sand, shells, and patches of coral, at a mile or more from the lighthouse, but not with it to the northward of N.N.W., as within that bearing the bottom is rocky. The best holding-ground in the roads, and clear of old anchors, is about midway between the lighthouse and the south buoy on English bank, in 5 or 6 fathoms; this is also a good position for communicating with the shore by boats. If intending to go into harbour be ready to get under way at three-quarters flood.

This roadstead is by no means a desirable place for vessels to remain longer than necessary, particularly at the change of seasons, and the seaman should be prepared to weigh or slip, should it come on to blow. Commander James S. Thurburn, R.N., says, "during "August, I scarcely know of one vessel lying in the roadstead which "did not loose her anchor."

Vessels visiting this port for any time should go inside the recife, as the expense of pilotage will soon be liquidated in the saving of the wear and tear of boats, and in the straining of the vessel, rigging, &c.*

Caution.—The sea breaks heavily on English bank, with the wind from the south-east quarter, the same as on the Olinda and other reefs. Open boats should be careful, as accidents have occurred by boats getting too near the breakers.

Directions.—Vessels approaching Pernambuco from the northward should, from October to January, make the land northward of Olinda, and in passing the point give it a berth of 3 miles, the reef in many parts being steep-to, and keeping in not less than 10 fathoms water, for within that depth the soundings are irregular. The mark to clear Olinda reef is a church with two steeples a little northward of the largest church in Santo Antonio, open southward of Picão lighthouse, and at night do not bring the light southward of W. by S.

From March to September vessels should make cape St. Agostinho, and proceed along the coast to the northward at the distance of about 3 miles, when Olinda will be seen. The convent of Nossa S. dos Prasêres with its two towers is a good mark for the coast immediately south of Pernambuco. In closing the anchorage, Olinda lighthouse should not be brought to the eastward of North until Picão lighthouse bears N.W. by N. or N.W., when it may be steered for, and there will be from 8 to 6 fathoms water, to the anchorage. At night, Picão light should be kept between the bearings of N.W. by N. and W.N.W., which leads clear of and between Ituba and Vettor Pisani shoals. Allowance must always be made for the current which sets strong, according to the monsoon.

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* During yellow-fever seasons all vessels have to remain outside the recife, it being by far more healthy, and not much more expensive. There is no comparison as to coolness, as unless a vessel is in the outer tier, all the filth and stench of the town with its stifling atmosphere surrounds the vessel and soon sickens the crew.—R. C. Corfield, Esq., H.B.M. Consul at Pernambuco, 1873.

Proceeding into the harbour pilots do not use Olinda channel, but pass southward of English bank, and from thence steer for Great pass, between the white buoy on the south side of the pass and a red buoy on the north side.

The COAST.—Pina point, at about 2¼ miles southward of Pernambuco lighthouse, is the extremity of a tongue of land projecting northward inside the recife, having some banks off it which uncover. The recife, uncovered and broken in places forming small bars, commences at Boa Viagem at 3¾ miles southward of the point, it extends northward to the lighthouse and lies parallel to the shore, at a distance of about 1¾ cables, with 3 to 6 feet water between. At a little more than 4 miles southward of Boa Viagem is Candeia point, the shore between forming a slight bay. At three-quarters of a mile northward of Candeia point is that of Venda Grande, at about the same distance farther north is a slight projection named Focinho da boy.

From Candeia point the shore trends in a southerly direction 2 miles to Barra des Jangadas, thence for about 6½ miles to cape St. Agostinho, forming an indentation. At about 5 miles southward of Pernambuco lighthouse is a range of hills, on one of which at about 1½ miles inland, stands the church of Nossa Senhora dos Prasêres, having two towers and being the highest object, forms a good distant mark for this part of the coast. To the southward, is the village and chapel of Boa Viagem, which being on the point, is conspicuous; also the convent of Piedade, the village of Venda Grande, and the village and church of Nossa Senhora da Candeias, and at 3½ miles northward of cape St. Agostinho, the village and church of São Gonzalo da Paiva, near which are some rugged white cliffs which appear from a distance as white patches. From the cape northward nearly as far as Pernambuco the shore is low and covered with trees.

At 1¾ miles northward of Venda Grande point, and nearly abreast the convent of Piedade, is the north end of a narrow chain of rocks with about 2 feet water on them; they extend to the southward for more than a mile at about half a mile from the shore. From Venda Grande point the recife turns to the southward, fronting the village of Candeias, and again terminates a little southward of Simão Pinto point north of Barre das Jangadas. The rocky bank extending to the southward from abreast the village of Afodados terminates about a mile southward of the bar of Jangadas.

Candeias bar, at 9½ miles southward of Pernambuco lighthouse, is formed by a break in the recife 125 yards wide fronting the village of the same name. It lies N.E. ½ N. from the church, and has a depth of 17 feet, mud, in the middle. Two rocky patches extending from the recife to the shore form the anchorage, but it is small and inconvenient.

Barre das Jangadas, about one mile southward of Simão Pinto point and 6 miles northward of cape St. Agostinho, communicates with the two rivers Pirapáma and Jaboatão. It is about 42 yards wide, with 3 to 6 feet water; but as it is exposed to all winds there is a heavy sea, and the sands shift. Coasting vessels of light draught can cross the bar only under favourable circumstances. Inside the bar there is a space of more than a third of a mile, with 2 and 3 fathoms water between sand-banks.

The Rio Jaboatão falls into the sea at Jangadas bar. Its mouth is about 300 yards wide with 2 to 2¾ fathoms water. It trends to the north-west and its muddy banks narrow gradually.

The Rio Pirapáma here also falls into the sea from the south-west. Its mouth is 140 yards wide, with more than 2 fathoms water; its stream runs with some strength and forms a waterfall at a little distance from its mouth.

Gaibú bay.—At 2 miles north-west of cape St. Agostinho is Pedras Pretas point, the space between is named Gaibú bay, where there is a depth of from 2 to 3 fathoms over mud and sand. The head of the bay is skirted by a chain of rocks close to the shore. Pedras Pretas point is also surrounded by rocks, and two isolated banks lie off it; the outer, with 14 feet, at one mile from the point, bears from cape St. Agostinho N. by E. ¾ E.; the other shoal is between the outer one and the point. In the bay at the foot of the cape is the little village of Gaibú, and about a mile from the cape is fort St. François Xavier de Gaibú, and in front of it the anchorage.

The bay affords shelter for small vessels from south-easterly winds, but the anchorage is limited and exposed to northerly winds, when communication with the shore is difficult.

CAPE ST. AGOSTINHO, at 17½ miles southward of Pernambuco lighthouse, is a rugged projecting promontory of moderate height. The cape is known by its red cliffs with a church and several cocoa-nut trees on its summit. Its base is formed by several points in detached large rocks, near which there are 5 and 6 fathoms

water. In clear weather it can be seen at a distance of about 24 miles. At the point of the cape is a rill of warm fresh water, named the rill of the Ladies; and the inhabitants of the village of Nazareth, on the summit of the cape, state that it never fails.

On the south side of the cape is fort Nazareth, and outside it a beach of sand named Salvação. At from 2 to 4 miles off shore there are from 11 to 15 fathoms water, sand and broken pearl shells.

LIGHT.—On cape St. Agostinho stands an iron tripod lighthouse, painted white, and 160 feet in height, from which is exhibited at an elevation of 344 feet above the sea, a *fixed* white light, visible in clear weather from a distance of 25 miles.

The COAST.—From cape St. Agostinho the coast to the southward for 14 miles to Serramby point is low, level, and covered with brushwood. At 6½ miles southward of the cape, lies Cupe point, a little salient, with a village, and cocoa-nut trees on either side of it. The point is surrounded by a reef. At 3 miles southward of Cupe point is Porto de Galinhas; at about the same distance farther south is Maracahype point, and at 1½ miles S.S.W. ½ W. of the latter is that of Serramby.

Between Cupe and Serramby points the coast is very low, and appears marshy. From the offing are seen quantities of cocoa-nut trees, the church of N. S. dos Oiteiros on a hill between Cupe and Maracahype points, and, in approaching the small villages of Cupe and Porto de Galinhas, another church near the sea at the mouth of the Maracahype. The shore is a white sandy beach.

The recife, which commences close to the coast forming the south part of cape St. Agostinho, is uncovered, and trends along shore, at a distance of one to 2 cables, to 1¼ miles southward of Camboa point, where it joins the coast. It reappears close in front of Cupe point, and extends along by Porto de Galinhas, and by Maracahype and Serramby points, terminating about three-quarters of a mile southward of the latter, and about one mile northward of San Aleixo island. The latter part is broken in places for distances of about a half to three-quarters of a mile, and north-east of Maracahype point it is nearly 1½ miles from the shore.

From about one mile north of Cupe point, to Maracahype point, the shore should be approached with caution, and not into less than 7 fathoms water, as shoal and irregular ground extends off from 1½ to 2 miles.

Rio Suápe.—This river falls into the sea at about 1½ miles south-west of cape St. Agostinho; it is 645 yards wide at its mouth, with 11 to 17 feet water over fine sand; at 2 miles up it is 215 yards wide with 3 to 5 feet water, when it suddenly narrows. The bar of Suápe, which leads also to the rivers Tatuóca, Ipojucã, and Merépe, is formed by a break in the recife close southward of cape St. Agostinho. It is narrow, the ebb tide is very strong, and when the wind is from seaward there is a heavy sea.

It is difficult and dangerous to pass, frequented only by small vessels which enter at high water, and leave a little before that time. During winter with south and south-east winds, vessels are sometimes detained for more than a month for a favourable moment to leave.

Rio Tatuóca, southward of the Suápe, has with it a common entrance about half a mile wide, bordered on either side by sand-banks. The Tatúoca is 130 yards wide at its mouth, but it widens within to between 220 and 435 yards, with depths of 10 to 14 feet. At 3 miles up it divides into two small rivulets; the Braza, running to the west, and the Taveira to the north-north-west.

Rio Ipojuca runs into the sea, through sand-banks which dry in places, at 3 miles southward of the cape, in the little bay formed by Camboa point on the south. It has from 5 to 7 feet water at its mouth, increases to 3 fathoms within, and deepens again for more than 3 miles up. It leads to the village of Ipojúca at about 7 miles from its entrance.

Rio Merépe runs into the sea close to the southward of the Ipojúca at 1¾ cables within Camboa point. Its mouth is 216 yards wide, but the river widens for about three-quarters of a mile, when it again narrows. The entrance is encumbered by coral, which is also found in the river, where there are depths of 7 to 10 feet along the eastern bank. At 2¼ miles up is the port of Jaiqui, which is three-quarters of a mile from the village, and is frequented by vessels of light draught for wood.

PORTO de GALINHAS.—The entrance to this port is formed between the northern extremity of the off-lying reef bordering this part of the coast, and a rocky isolated bank 1½ cables distant to the northward, and is situated N.E. by E. ½ E., three-quarters of a mile from Galinhas point. In the middle of the entrance there is a depth of 3½ fathoms, and farther in 2¾ and 2½ fathoms, mud bottom, but

near the shore, coarse sand. A chain of rocks extend from the south point of entrance, which become scattered, and encumber the port. The anchorage is exposed, being open to the bar; but small vessels whose draught will admit, may anchor in front of the town by passing over the rocks at high water.

Vessels approaching Galinhas bar, when at a distance of 3 miles from the coast, should keep the two round mountains, which are behind Galinhas village, and distinctly seen, open northward of the cocoa-nut trees north of the village on Galinhas point, and steer in with the point bearing S.W. by W. ½ W. for the bar, at about three-quarters of a mile northward of the point. With the wind from north to east, a vessel can enter the port round the north end of the rocky bank, between it and Cupe; but with southerly winds the passage first named should be taken.

Rio Maracahype runs into the sea from the northward, between the point of the same name and that of Serramby; its mouth is about 50 yards wide, increasing within for about 3 miles, and then narrows rapidly; it has 10 feet water at its mouth, and 7 to 14 feet in the river.

RIO SERINHAEM falls into the sea, southward of Serramby point and westward of San Aleixo island. Its mouth, about 210 yards wide, is obstructed by sand-banks, leaving a channel navigable for small vessels, which load with wood about 6 miles in the interior. The Trapixe disembogues from the westward, having a common entrance with the Serinhaem. It is about 3 miles in length, carries from about 6 to 9 feet water, and is navigable as far as the mill of the same name.

The recife from Serramby point to about 1½ miles south-west of San Aleixo, skirts the coast at the distance of half a mile, and covers the mouth of the river; it is bordered by a bank with isolated rocks; inside the reef there are a number of dry sand-banks and isolated rocks.

This part of the coast may be recognised by San Aleixo island and Serra Sellada at about 16 miles north-west of the island. Near the mouth of Rio Formoso, 5 miles to the southward, on the summit of a hill, is the church of N. S. de Guadalupe, and more to the north in the interior, on the summit of another hill, is the town of Serinhaem and convent of San Francisco; also the villages of Barra de Serinhaem, Gamella Sta. Anna, and Barra de Rio Formóso are seen from a certain distance, at the mouths of the rivers.

Serra Sellada, or Saddle hill, about 13 miles inland, and about midway between cape St. Agostinho and Maracahype point, is a ridge of high land extending north and south, with a break in the middle dividing it into two round hummocks. This is the highest land in the neighbourhood, and is in about latitude 8° 24′ S., longitude 35° 12′ W.

SAN ALEIXO ISLAND.*—At about 3½ miles S.S.W. of Maracahype point is the island of San Aleixo, nearly a quarter of a mile in extent, and 70 feet high at its south-west end. There are two houses, and a well of fresh water; a few sheep and poultry are reared on the island. From the north-west part of San Aleixo a reef extends westward for 2 cables; at the distance of 2½ cables from the south end, and connected by a reef, is Turtle rock, which always shows; the reef continues about a cable to the south-westward of the rock. At the distance of three-quarters of a mile eastward of the island there is a depth of 9 fathoms, clay bottom; at a quarter of a mile, 7 fathoms.

About three-quarters of a mile inside the island is a passage through the recife for country boats to the mouth of the Serinhaem, but the sea breaks across it.

Anchorage will be found inside the island in depths of 4 and 5 fathoms, sand and fine gravel. Proceeding in southward of the island, steer with the tallest cocoa-nut tree in the village bearing N.N.W. ¼ W.; but as the dark background makes it sometimes difficult to distinguish, give the Turtle rock a berth of 4 cables, keep the lead going, and when in 6 or 7 fathoms, haul to the northward and anchor where convenient. Captain Buckle of H.M.S. *Growler* visited this anchorage three times in September and October, and found it safe and well sheltered.

Tides.—It is high water, full and change, at San Aleixo island, at about 4h. 20m.; and the rise of tide is from 10 to 12 feet.

RIO FORMOSO.—This river falls into the sea at 5 miles S.W. from San Aleixo island, and 4 miles northward of Tamandare fort; it is 456 yards across at its mouth, but widens a little within for about a mile, when it narrows, and after passing the town of Formoso there is hardly room for a boat. Within the entrance on the south side is a sand-bank leaving between it and the north shore

* *See* Admiralty plan:—San Aleixo island, No. 1,647; scale, *m* = 5 inches centre.

a passage into the river carrying 8 feet water, which increases farther on to 17 feet.

The town of Formoso stands on the right bank about 5 miles from the entrance. Passo rivulet runs into the Formoso from the northward at 1½ miles within its mouth, and the Ariquinda from the southward at one mile. A remarkable building stands on the north point of entrance, and there are two white cliffs to the southward.

Gamella bar, the principal entrance to Rio Formoso, is 1½ miles northward of the mouth of the river, and from 85 to 110 yards in breadth with 2 fathoms water, on muddy bottom. It is formed by a break in the barrier reef which stretches close along shore, covering the mouth of the river from the south point of entrance to the northward of the village of Gamella. Outside the bar the water deepens to 5 and 6 fathoms over mud and fine sand, where vessels of more than 5 feet draught should anchor.

At Gamella point on a hill in front of the village are some black rocks which are conspicuous from the offing in contrast with the white sand.

From Manguinho, the south entrance point of Rio Formoso, to Tamandare, at 3 miles south of it, the coast is low and void of trees. The shore immediately south of the point makes a slight bend and forms Campas bay. The recife, which is uncovered at the little bar of Bobo, northward of Tamandare, becomes covered in places and broken into detached rocks until the mouth of the Formoso bears W.N.W., when it rises rapidly and shows three heads, named Juia or Criminóso, to the north of which it is again covered, terminating with the village of Gamella bearing about W. ½ S. distant 2 miles.

The recife is skirted by sunken rocks. The space which separates it from the shore is also full of rocks, being a continuation of those in the north part of Tamandare bay. This part of the coast is but little sheltered, and completely deserted. As the recife is often covered, the sea beats on the shingle shore with violence.

Directions.—Gamella bar is known by the village and cocoa-nut trees on the point. In coming from the northward, having passed San Aleixo island, steer in the direction of Gamella point, taking care to avoid the reef extending southward across the mouth of the Serinhaem. When the church of N.S. de Guadalupe (on the hill of the same name) is in line with the cocoa-nut trees on Gamella point, then steer about S.W. ¾ W. for the bar, leaving the north end of the

barrier reef, which is more than 2 miles from the shore, to the eastward.

In coming from the southward, steer with San Aleixo island bearing about North, until the above church is on with the cocoa-nut trees, then proceed as before. The anchorage inside the bar is very limited, fit only for the smallest coasters, and is on muddy bottom in front of the village.

TAMANDARE.—The port of Tamandare, sufficiently large for several vessels, is formed by a bay fronted by the recife. The entrance is through a break in the reef about 4 cables in breadth, from which the fort bears about N.N.W. ½ W. distant 1½ miles, but is contracted by two reefs named the Baixa Grande, and the Baixinda. On the northern reef there is a depth of 14 feet; and on the southern, 10 feet.

In the middle of the entrance, south of Baixa Grande, which is the wider channel, there is a depth of 6 fathoms, mud bottom, and north of that shoal 5 and 6 fathoms. Baixa Grande, nearly in mid-channel, has a depth of 13 feet, and 4 to 6 fathoms around it. The Baixinda is about 20 yards in extent east and west, with 10 feet on it, and lies north-west of Baixa Grande.

Anchorage.—The anchorage has from 3½ to 4 fathoms water close to the shore, and is protected by the recife, here named Ilha da Barra, but a vessel should not go far to the north on account of a chain of rocks which extends from Ilha da Barra to Tamandare. There is, however, in the south part of the port, a large space with good anchorage, but as the exterior recife is low and covered at half tide, it is exposed to all winds.

In the bay, at rather less than a mile northward of Ilhetas point, is the entrance of the two little rivers Brejo and Ilhetas, but it is completely obstructed, and at low tides fronted by a bank. The village of Tamandare stands on the sandy shore south of the point of the same name, and southward of it is a square fort. The port is capable of being improved, and from the fertile surrounding plains it may in the future acquire importance. It is the only place capable of affording any shelter from Pernambuco to Maceio.

Water can be procured from a well at the back of the fort. The casks have to be rolled some distance over soft sand, and not more than 15 tons can be obtained in a day. There is no trade here, it being merely a stopping place for coasters.

Directions.—The entrance to Tamandare will be known by the village and the square fort south of it, and some red cliffy land in the interior, also by an oblong hill named mount Brito with some cocoa-nut trees on the summit and an isolated house, and the same on the north extremity of the hill. Having seen the fort, steer for it until at 3 miles from the shore, when the red cliff will be seen.

Bring the cliff in line with the cocoa-nut trees on the north extremity of mount Brito, and steer to the N.W. for the bar, passing between Baixa Grande and the southern reef, and continuing the same route towards the fort until Ilha da Barra is passed; then steer to the north and anchor where convenient. South-eastward of the fort there is also anchorage, but the entrance is wide and exposed to the sea, which renders it uneasy.

The COAST from Ilhetas or Mamucabinha point trends in a south-westerly direction for 6 miles to Gravatá point, forming between an indentation, in the southern part of which the river Una runs into the sea, and at 3 miles beyond the latter point is that of San José; the shore between is low, with the exception of a large and elevated rock named Pedra do Conde, which is isolated and remarkable, and here the hills are close to the shore. At about 1¼ miles northward of Pedra do Conde is a cluster of small rocks close to the shore named Pedra do Porto.

The village of Abreu de Una, on the west bank of the river, is conspicuous from the offing. The recife, which is covered in places, passes at less than a mile from Ilhetas point, and about 1¾ miles from the middle of the bay, where, south-east of Pedra do Conde, it leaves a large open space named the pass of Una. The village of San Jose, with its hermitage on the point of the same name, is also remarkable. From this latter point to that of Antunes, at 8 miles farther on, the coast is uniform, but northward of Mangues point the land rises a little. The recife rises again at 1¼ miles from the shore, with Gravata point, south of the Una, bearing W.S.W., and trends southward broken in places as far as Barra Grande. It is bordered by a rocky bank at the distance of half a mile.

Una pass (Caixao de Una) is formed by an open space in the barrier reef of about 1½ miles wide, and leads to an anchorage on the north, having 2 fathoms water. The extremity of the reef on the southern side of the pass lies with Gravatá point bearing W.S.W., and that on the northern side with Gravatá point S.W. by W., and Pedra do Conde N.W. From Gravatá point an inner reef in detached

rocks extends northward across the mouth of the Una for nearly 2 miles, or until the chapel of Varzeu bears N.W. by W. ½ W.; the reef is broken in two parts, leaving a passage for small vessels to the Una river. There is also anchorage in 2 fathoms, on muddy bottom, inside the northern portion of the inner reef, named Caixao, but it should be approached with a fair wind, and a vessel should not proceed too far in, as there are sand-banks, and the current from the Una is very strong.

Directions.—The land northward of the Una is uniform, but it has a break at the village of Vau, which is seen when abreast it. At the same time a small cliff is seen, which should be brought in line with Pedra do Conde, then steer N.W. for the anchorage, passing the northern reef, which always shows, at a prudent distance. In coming from the southward the constant line of breakers will be seen, and a vessel should be guided by the Pedra do Conde as before, but it should not be mistaken for that of Pedra do Porto at about 1¼ miles northward of it.

Rio Una enters the sea at 7 miles southward of Tamandare fort; it is about 16 yards wide at its mouth with 7 feet water, and is obstructed by a bank having only 4 feet on it, and on which the sea breaks in fresh breezes. Within, the river forms a pool on the south, where is situated the villages of Varzeu and Vaú Una, also to the town of Barreiros, where a quantity of sugar is shipped. The current of the Una is rapid, and small vessels which frequent it are only able to descend when the water is high. In the summer, the stream is less strong than in the winter, at which season it is dangerous.

Rio Cruz empties itself into the sea about half a mile southward of Gravatá point, south of the Una; it is about 50 yards wide at its mouth, with 4 to 6 feet water, and leads to Campina Grande, a distance of 39 miles.

Rio Persinunga, in lat. 8° 56′ S., long. 35° 11′ W., is about 12 miles in length, and separates the provinces of Pernambuco and Maceió. Its mouth is about 20 yards wide with little more than a foot of water, and consequently not navigable; on its south point are three or four huts.

BARRA GRANDE, situated 7 miles south of Rio Persinunga, is easily known by the different white cliffs north-east of the church

or convent of Saõ Bento (near a large house on the summit of a hill of the same name), and which extend northward to the church of Barra Grande, standing on rising land near the shore, as well as by the village of Gamélla, situated between the hills southward of Barra Grande.

The port of Barra Grande is in a bay about 2¼ miles deep, between Saõ Bento point on the south, and Antunes point on the north, a distance of 7 miles; but the part known as the port of Barra Grande covers only a space of about 2½ miles in length and 1¾ miles in breadth. The bay is fronted and formed by the barrier reef which extends along the coast from the northward, passing 1½ miles from Antunes point, thence southward, trending about south-west, with several openings, and continuing generally covered, in large detached rocks, named Alagados de Japaratuba.

The most important of these openings is the Barra Grande, which lies east of Gamélla; at 6½ cables to the north is a second opening named Barreta de Canindé, and at the same distance on the south is a third opening named Alagados. The entrance to Barra Grande, about three-quarters of a cable wide, lies with the church of the same name bearing N.W. ¼ N., and that of Saõ Bento W. by S. ¼ S. At the entrance there is a depth of 3¾ fathoms, and from 2 to 3¾ fathoms inside the reef. A patch of 2¾ fathoms lies 4 cables south-east of the entrance. On approaching the bar bring a conical green hill midway between two cliffs, and steer about N.W. over the bar.

When inside the bar a vessel may anchor off the town of Barra Grande, but not too far to the northward, in order to avoid the sand-bank which stretches from the shore to the recife; or southward of the town of Gamélla. An inner reef commences near the town of Gamélla, curving seaward at a distance of one mile, and extending as far south as Port de Pedras, where it again unites with the shore; it is broken in places, and has from one to 2 fathoms inside it.

Rio Salgada runs into the sea, a little southward of the church of Saõ Bento. It is 18 miles in length, 25 yards wide at its mouth, with about 4 feet water. Northward of it are the small rivers Maragogy and Páus, which are 6 and 12 miles in length, but of no importance.

Serras of Marambaya.—Westward of Barra Grande, and about 25 miles inland, are the Serras of Marambaya, a conspicuous chain of mountains which may be seen at the distance of 45 miles. The surrounding land has no diversity of appearance.

PORT de PEDRAS, at about 9 miles southward of Barra Grande, is protected by the barrier reef, and has in it depths of 3 and 4 fathoms, sandy bottom. The port is capable of admitting five or six vessels of about 120 tons. Strangers should approach cautiously with the lead. At about three-quarters of a mile northward of the reef which shelters the anchorage, lies a shoal named Baixa Grande, and nearly the same distance north and north-west of it, two other shoals with 4½ to 6 fathoms between them. Rio Porto Calvo enters the sea southward of the anchorage, and the town which stands on the south side of the entrance carries on a small trade.

The COAST.—From Port de Pedras to the Rio Camaragibe, 13 miles to the south-west, the land is level, dotted with low brushwood and cocoa-nut trees, and having a white sandy beach bordered by the barrier reef, which is about a mile from the shore. On the south side of the Camaragibe is a range of bare cliffs of red sand. Near the river Sto. Antonio-mirim, or little Sto. Antonio, at 17 miles farther south, is also a range of red cliffs 1½ miles in extent, and three small round hills which stand on its northern side; between the two rivers is that of Sto. Antonio Grande, also several small streams, and one or two villages.

The shore along this latter part of the coast is bordered by the recife, which is broken and uncovered in places, and extends from one to 1½ miles from the shore, terminating a little south-west of the Sto. Antonio-mirim. From thence the coast continues to the south-west for 7 miles to Verde point, having between several small streams, and the rocks in some parts extend off about three-quarters of a mile.

Anchorage.—There is anchorage with northerly winds, protected by the shoals and reefs southward of the entrance to Rio Camaragibe, in 2½ to 4 fathoms water, muddy bottom.

Verde point, the north-eastern point of Maceio bay, is low and has on it several cocoa-nut trees; it is salient, and surrounded by rocks on which the sea breaks heavily. The coast northward of it is generally sandy with small portions of reddish cliffs, and partly covered with cocoa-nut trees.

MACEIO* is the only convenient anchorage between Pernambuco and Bahia, in a bay formed by the land trending westward from

* *See* Admiralty chart:—Maceio to Rio de Francisco do Norte, No. 892, scale, $m = 0{\cdot}4$ of an inch; and plan of port Maceio, with views, No. 539, scale, $m = 4$ inches.

Verde point, and protected from all northerly winds and as far south as E.S.E. by the reef, which terminates suddenly at 2 miles west-south-westward of Verde point, and which is covered at high water. A buoy is moored near this extremity of the reef. The shore of the bay is a white sandy beach, along which, interspersed with cocoa-nut trees, is the village of Jurugua, and about half a mile eastward, in an outer bay, is the village of Paijucara, with a sandy point between, on which stands the Port Captain's office, and a soap factory having a tall conspicuous chimney which shows well from seaward.

In the summer months this bay may be considered safe, but from May to September, when the southerly winds prevail, it is much exposed, and a heavy swell sets in. With southerly winds the landing is bad at low water, the steps at the trapiche, or covered wharf, being the only place to land.

Close to the westward of Jurugua is a rivulet, with another small fort; and on the hill above, on the western side of a wooded bluff, is the town of Maceio, the capital of the province of Alagoas, with a population of about 13,000.

Railway.—There is a railway from Maceio to Imperatriz, length open (1888) 55 miles.

Exports—Imports.—The principal exports are cotton, hides, sugar, and rum. The value of the exports in 1882 was 674,000*l.*, and of the imports 164,000*l.* In 1882, 370 vessels, of 272,000 tons, entered the port, of which 105 vessels were British.

Supplies.—All kinds of supplies are to be had, but they are very dear. Water can be obtained by digging wells, or in the bay of Paijucara at a well near the beach. Fish are plentiful near the reefs and in the lagoon.

Shoals.—At nearly 1¼ miles S.S.W. ½ W. from the fort eastward of Jurugua, or about 4 cables from the southern extremity of the reef, is Baixo, a detached shoal, with 15 feet water, and on which the sea breaks with strong southerly winds.

The shoal lying about 2¼ cables westward of Baixo shoal has a depth of 2½ fathoms on it at low water spring tides.

Another shoal lies north-west of Baixo shoal, and nearly midway between the shoal above mentioned and the buoy at the south-west extreme of the barrier reef. This shoal, of small extent and composed of coral, has 2½ fathoms on it at low water spring tides,

with 7 to 8 fathoms close around; it lies with the north-west extreme of Baixo shoal bearing S.E. ¼ E., distant 3½ cables.

LIGHT.—On the south-western point of the hill on the east side of the town of Maceio stands a lighthouse, which exhibits, at the height of 208 feet above the level of the sea, a light of the third order, which should be seen in clear weather from a distance of 22 miles. The light is fixed, with a *flash* every *two minutes*. It shows a steady white light for *seventy seconds*, it is then eclipsed for *sixteen seconds*, then a white light for *twelve seconds*, another eclipse for *twenty-two seconds*, then again the steady light; thus completing its phases in an interval of two minutes.

Pilots.—The harbour-master at the village of Jurugua will come off to vessels on the usual signals for a pilot being made; but the men who fish in the jangadas, or sailing rafts, which are constantly met with on this coast, are good pilots.

Tides.—It is high water, full and change, in Maceio bay, at 4h. 30m.; springs rise 8½ feet.

Directions.—From March to September vessels should approach the bay from the southward on account of the current (page). The land may be known by mount Barriga standing alone in the interior; by a reddish spot on the face of the cliff about 5 miles south-west of Maceio; and by a white chapel with two towers in the same direction. The president's palace, a large square white building, the house of assembly, new church, and lighthouse at Maceio can also be seen from a long distance. There is nothing on the coast to indicate the position of Maceio to vessels coming from the northward, but in closing with the bay, Verde point being salient and surrounded by breakers cannot be mistaken, to which give a berth, and in rounding the reefs Maceio will be seen.

A remarkable red patch on the western side of the bay bearing about W. ¾ N. will lead between the detached shoal and the reefs in 8 to 6 fathoms water;* the reef is easily seen, but must not be passed too close; then haul up for the anchorage, leaving the buoy on the end of the reef on the starboard hand, and anchor where convenient to the north-west of it in about 4½ fathoms, sand and clay, clear bottom. In approaching from the southward keep the light bearing

* This channel is reported to be unsafe, and therefore should be used with caution.—Master of S.S. *Memling*, 1883.

about N. by E., which will lead nearly up to the anchorage, then proceed as necessary.

Lagoa (Lagoon) do Norte is about 4 miles in length in a north-west direction and 2½ miles in breadth, having from 3 to 8 feet water, muddy bottom. The Rio Mundahu runs into its inner or north-west part. Many houses are scattered along its north-east, and two villages with their chapels on its south-west bank. Its narrow entrance is 2¾ miles south-west of Maceio lighthouse, and the passage in, with a depth of about 4 feet, is between low islets and shoals for 2 miles.

LAGOA MANGUABA, at about 4 miles westward of and parallel to lagoa do Norte, runs into the interior for nearly 19 miles; at 3½ miles from the sea it gradually widens till it attains a width of 3 miles at its head, with depths of 4 to 14 feet, muddy bottom. Several small streams empty themselves into it, and two or three villages stand on its banks. The entrance to this lagoon is in common with that of the lagoa do Norte, and runs to south-westward inside a narrow tongue for 3 miles, when it trends to the westward a little northward of port Francez.

From the south-west part of the lagoa do Norte a narrow stream winds to the south-west into that leading to the lagoa Manguaba and forming with it Sta. Rita island. The town of Alagōas stands at the south end of the lagoon at 3½ miles from the coast. The produce of the interior is brought to the coast through the lagoons by means of boats.

RIO DE SAN MIGUEL.—At 8 miles south-west of Verde point is port Francez, which is small and can be used only by small coasters. About 6 miles farther to the south-west is the bar of Rio de San Miguel. The town of Santa Anna stands on the northern point of entrance, and here the produce of the surrounding country is shipped in small coasters. From a little distance seaward, the roads about Santa Anna may be seen. From the entrance to the lagoa do Norte, the low shore to the south-west is skirted close-to by the recife, forming port Francez, and covering the mouth of Rio de San Miguel.

Anchorage.—At one mile off the south point of entrance to Rio de S. Miguel are some sunken rocks which extend south-westward for 2 miles; the north rocks are occasionally uncovered. Inside

them there is anchorage in fine weather in 2 or 2½ fathoms, sand and mud.

LAGOA DE JIQUIA.—The shore from the San Miguel tends in a south-westerly direction for 15 miles to the bar of lagoa de Jiquia; midway is Azeda point with a few cocoa-nut trees; it projects a little, and shoals extend off for 1¼ miles, with 7 fathoms water close to them. The lagoa de Jiquia extends north-westward for a distance of 11 miles, where the river of the same name falls into it. This lagoon is 1¾ miles wide, with 6 feet water in the entrance channel, and from 6 to 17 feet water inside. It is navigable at high water springs for craft of about 80 tons. Coasters anchor outside the bar.

COAST.—The coast in the vicinity of lagoa de Jiquia is about 80 feet high, nearly level, tolerably wooded, with several reddish cliffs, and a sandy shore; immediately within, the land is formed into several lakes or lagoons which have a small outlet to the sea.

From the entrance to the lagoa de Jiquia, the coast continues to the south-west for 10 miles to the mouth of Rio Coruripe, and 25 miles farther to the south-west is the bar of Rio San Francisco. It is low, sandy, and as far as 9 miles to the south-west of Coruripe point are several outlying dangers, hereafter described.

CORURIPE POINT in lat. 10° 10′ S., long. 36° 6′ W. projects seaward, forming a bay open to the southward nearly a mile deep, encumbered by rocks, and where the river of the same name runs into the sea. A village and several cocoa-nut trees stand on the point. At one mile S.E. by E. of the point, the barrier reef rises, and extends for 5 miles in a southerly direction along the coast at the distance of 2¼ miles, broken and uncovered in places. The south-west end has 4 feet water on it, with Miahy hill bearing N.W. by N.

Inside the central part of the recife there are numerous sunken rocks. There is, however, anchorage in 2½ fathoms water, between the rocks and those in the bay. The passage in is between the north end of the barrier reef and Coruripe point. There is also anchorage protected from southerly winds in 2¾ fathoms water on the north side of Péba point. The latter point has on it two or three houses and some cocoa-nut trees.

SHOALS.—**Dom Rodrigo rocks** situated about 3 miles in a S.E. by S. direction from Coruripe point are uncovered at low water;

these rocks are upwards of a mile from the reef fronting the mouth of the Coruripe river, with 5½ and 6 fathoms water between them and the reef.

Lages de Miahy is more than a mile in length with a least depth of 3¼ fathoms, and lies 3½ miles S.W. ½ W. of Dom Rodrigo rocks, with Coruripe point bearing N. by E. ¾ E. distant 5 miles, and 1½ miles from the barrier reef.

Baixos de Japú situated 3 miles south-west of Lages de Miahy is 1⅓ miles in length north-east and south-west, with a least depth of 1¼ fathoms. It lies 4¼ miles from the shore, with the little hill of Japú, known by two cocoa-nut trees, bearing N.N.W. ½ W.; and Moita das Oncas, a hill northward of Péba point, W. by N ¼ N. These dangers have 7 and 8 fathoms close to them. A patch of 5½ fathoms lies to the south-westward of Baixos do Japú, with Péba point bearing W.N.W. distant 3¼ miles, and Moita das Oncas N.W. ½ N. It is not prudent to approach the coast nearer than 11 fathoms.

RIO SAN FRANCISCO do NORTE empties itself into the sea at 24 miles south-west of Coruripe point. The surrounding country, near the mouth, is well populated and produces sugar cane, cotton, wood, and tobacco in abundance.

The principal town in the neighbourhood of the coast is Penedo, on the left bank of the river about 24 miles from the bar. The north entrance point, and the coast northward of it, is of low quicksand without vegetation. Manguinha, the south entrance point, is low, flat, covered with mangroves, and projects to the south-east.

Bar.—Heavy breakers extend seaward from both entrance points for a distance of 1½ miles, between which, in an E.S.E. direction from the lighthouse, is the bar with a depth of about 9 feet at low water. In S.E. winds there is a heavy sea on the bar.

The maximum draught for vessels entering the river is considered to be 12½ feet. The services of a pilot are necessary, who will signal the draught of the vessels to the signal station before proceeding.

Within the bar the river deepens to about 5 fathoms, thence to Ilha dos Bois and Muffins point the depth decreases to about 11 feet, and nearer Penedo, to 8 feet; abreast Penedo there is 5½ fathoms. The tide is not felt above this. It is stated that in December and January the river frequently rises from 6 to 8 feet above the ordinary

level, at which times there is more water on the bar. Leaving the river is difficult in a sailing vessel on account of the prevailing wind, but tugs, which also carry on the river traffic, are available, at a cost, irrespective of the size of vessel, of about £50.

Anchorage.—The ordinary anchorage outside is to the southward of the bar in about 7 fathoms, but it is an uncomfortable one; that to the northward, under shelter of the banks, is to be preferred.

There is anchorage in the river, off the village on the north bank, about half a mile within the entrance points.

LIGHT.—From an iron, octagonal tower, painted white, on Samôco point, south-west side of entrance to the river, is exhibited, at an elevation of 59 feet above the sea, a fixed white light, which should be visible in clear weather from a distance of 10 miles.

The COAST from the entrance of Rio San Francisco is low and trends in a south-west direction for about 49 miles to the bar of the river Cotinguiba. At 6 miles from the mouth of the San Francisco is a small offshoot from that river, named Barra Nova, which discharges water during the rainy season; at 25 miles farther to the south-west is Japaratuba rivulet; and about 18 miles farther on is the mouth of the Cotinguiba. The shore between, a low and uniform plateau, is backed by the Serra de Pacatuba, and farther in the interior, to the west and south-west, are the Serras de Coralinho and Itabayanna, which are seen only in clear weather.

To the north-west of Cotinguiba bar is mount Aracaju, remarkable from a cut or notch at its northern extremity, and a church with two towers on its south side; N.W. by W. ½W. from it will be seen the Cardinal's hat (so named from its similarity in shape), the southern peak of the Itabayanna range. Vessels should not approach this part of the coast very near, as with strong south-easterly winds it would be difficult to gain an offing. The beach is flat, and the bottom hard sand.

RIVER COTINGUIBA (Port Aracaju) is much frequented. The bar at the entrance has about 10 feet over it at high water between the months of September and March, and at other times from 7 to 9 feet.*

* The bar was reported to have 12 to 14 feet water in 1877.

The town of Maroim is situated about 8 miles up the river from Aracaju, and can only be approached by boats or small craft drawing not more than 2 feet of water.

The approach to the river may be known by the Morro de Telha, by mount Aracaju, and also by the light-house at its entrance. At 3 or 4 miles off shore, there is a depth of 5 or 6 fathoms.

As vessels cannot get under weigh from the anchorage in the river before the ebb tide begins, and as much time may be lost before reaching the bar, they ought not to draw more than 10 feet; and vessels of this draught are often considerably delayed. There is a steam tug here of 150 tons register; the charge for towing in, being 500 reis per ton, and out 100 reis per ton; 100 tons register is equal to 128 tons Brazilian.

LIGHT.—On the south side of the entrance to Cotinguiba river stands a conical white tower, 109 feet high, from which, at an elevation of 125 feet, is exhibited a *fixed and flashing* white light. Reported to show fixed for *thirty seconds*, followed by *five flashes* of *two seconds* each, separated by eclipses of *three seconds*, 1892, visible in clear weather from a distance of 17 miles.

Buoy.—A large iron buoy, painted red, is placed off the bar in 9 fathoms, to prevent this river entrance being mistaken for Vaza Barris river 14 miles to the southward, where there is a similar signal tower with the exception that the flagstaff has no cross arms.

From the buoy, Cotinguiba tower bears N.W. ¾ N., distant 4 to 5 miles, a good position for a vessel to await the pilot. Vessels may temporarily secure to the buoy.

Directions.—Signals for the guidance of vessels crossing the bar are made from the summit of the lighthouse.

1. A white flag at the mast-head denotes—vessel seen from the shore.

2. The white flag on the flagstaff, and a black ball hoisted on a runner between the two angular poles north and south of the tower, is only hoisted when there is sufficient water on the bar, and the tide favourable for entering.

This black ball is moved to the north or south pole according to the direction the vessel should steer; when the ball is directly under the white flag the vessel is steering correctly, and the signals will remain flying to guide the vessel until she has passed the tower.

3. If the white flag is hoisted and lowered again, it implies that the vessel should stand off and wait for the tide.

4. Any other signals that may be hoisted do not refer to vessels outside the bar.

If the master of a vessel has never been in the Cotinguiba, he should not enter without a pilot, or avail himself of the signals, unless in case of absolute necessity. The pilot boat is smack rigged, and will come out with the first of the ebb.* There is good anchorage northward of the bar in 6 or 7 fathoms water, fine hard sand; and for small vessels in 4 fathoms, over mud and fine sand. Vessels should, if possible, always remain under way and if too late for the pilot to come off that night, they should make the signal and stand to sea, keeping well to the northward or southward according to the prevailing current, and be in a position to meet the pilot in the morning.

The shipping season is from November to April, at which period the land should be made well to the northward of the river, as the current sets to the southward along the coast at the rate of from 1½ to 2 miles an hour.

RIO VAZABARRIS (SERGIPE), situated about 14 miles south-west of the Cotinguiba, may be known from the south-eastward by three small hills, of equal size, covered with brushwood, named Os Tres Irmaõs (the three brothers), at about 9 miles to the south-west; also by the whiteness of the sandy south entrance point, on which there is a signal station, elevated about 40 feet, where signals are shown when a vessel is sighted. The river derives its name from the town of Sergipe, at the foot of these hills, on one of the branches of the river. At Vazabarris bar, the signals are nearly similar to those at Cotinguiba. The channel across the bar, lies in a W. ½ N. direction, with 12 feet at mean low water, and 23 feet at high spring tides.

During the northern monsoon the bar is always smooth and a vessel may load to 14 feet at mean high water.

After crossing the bar the river trends N.W. ¾ N. about 2 miles, with 10 fathoms, hard sand; thence W. by N. ¾ N. for 9 miles, with 9 to 5 fathoms, mud; and then W.S.W. about 2 miles to the anchorage in 3 fathoms, soft mud, off the wharf where sugar is

* It is reported that "pilots are scarcely ever to be obtained for vessels entering the river."

shipped. It is here necessary to moor head and stern as the river is very narrow.

The town of San Christavao can only be visited in a canoe, which the master must do to enter and clear his vessel.

When loaded, sailing-vessels must tow out. A tug can be procured from Aracaju.

Buoy.—The spare telegraph cable belonging to the Western Brazilian Telegraph Company is marked by a buoy in lat. 11° 14′ S., long. 36° 57′ W., abreast the Rio Vazabarris.

RIO REAL lies about 23 miles south-west of Rio Vazabarris; the mouth of this river cannot be seen from the sea, but will be known by the breakers seaward of it. Mangue Secca, the south point of entrance, extends from a beach of white sand, known to the coasters as the Prancha, or plank of Rio Real. The bar is said carry 15 feet water at springs, but there is generally a heavy sea, and it should not be attempted without a pilot. In the vicinity of the bar there are a few houses, seen at a distance of 2 miles from seaward.

LIGHT.—On the north side of the entrance of Rio Real stands a quadrangular white tower, 69 feet high, from which is exhibited, at an elevation of 70 feet above high water, a *fixed* white light, seen in clear weather from a distance of 10 miles.

RIO ITAPICURU.—At about 19 miles south-west of the bar of Rio Real is that of Itapicuru, obstructed by breakers, and said to carry 7 or 8 feet at high water. There is a village on the south point of entrance, and another some distance within. With the river bearing about West, some downs will be seen over it a little higher than those to the right or left. Small coasters and jangadas enter this river.

The COAST from Cotinguiba bar trends south-westward for about 37 miles to the mouth of Rio Real; from thence, more southerly to a little beyond the parallel of 12° S. At 6 or 7 miles from the bar of Itapicuru, the Oiteros de San Miguel, a series of small hills, border the coast to the south-west. From about the parallel of 12° S. the shore again trends to the south-west for 40 miles, to the tower of Garcia de Avila, a sort of fort with a signal post, standing among trees on rising land, and the most remarkable object on this part of the coast. At about 11 miles northward of Garcia de Avila is mount Massarandupio.

From the tower of Garcia de Avila the coast continues to the south-west for 30 miles to Itapuan point, on which is a small village; and thence about W.S.W. for 18 miles to San Antonio point. It is composed of sandy downs, varied by small brushwood and cocoa-nut trees, with a white sandy shore, bordered by the recife, many parts of which are always above water, appearing detached from the coast like islets; particularly those about Itapuan point.

The shore may be approached to the distance of a mile in 11 to 14 fathoms, mud, sand, and coral. The water deepens suddenly, and at 10 miles from the land, in places there is no bottom with 35 fathoms.

LIGHT.—On Piraboca rock one cable from the shore near Itapuan point is a round iron lighthouse, painted red, which exhibits at an elevation of 68 feet above high water a *fixed* white light, visible from a distance of 14 miles.

SAN ANTONIO POINT, the south-west extreme of the land forming the eastern side of the entrance to Bahia, is of moderate height, covered with trees, and can be seen in clear weather from a distance of 30 miles. The land in the vicinity of the cape is higher than that to the westward. Fort San Antonio, with its lighthouse, stands on the extremity of the cape, and at 3 miles eastward of it, there are three or four brown looking bluffs; eastward of which lies Itaquanzinho point, another low brown bluff, with cocoa-nut trees.

When coming from the northward and eastward, San Antonio point will be shut in with the westernmost bluff, and when first seen at a distance appears a little separated from the mainland. Between this bluff and point are many houses. The landing on this part of the coast is difficult, and here the recife or barrier reef terminates.

LIGHT.—A light is exhibited from fort San Antonio at the height of 167 feet above high water, and in clear weather should be seen from a distance of 19 miles. The light is *flashing*, showing two *white* flashes and one *red* flash with an interval between each flash of *ten seconds*.

SAN ANTONIO BANK, an irregular shaped shoal, composed of red sand and coral, is the principal danger in entering the anchorage of Bahia. It extends north and south 4 miles, and its greatest breadth is about one mile; the general depths over it are 4 and 5 fathoms, but on the north end of the bank, at about three-quarters of a mile S.S.E. from the lighthouse, there is a patch of 3 fathoms, and 2¼ fathoms half a mile southward of it. A depth of 3¼ fathoms will

be found on the south end of the bank at 4½ miles S. ⅛ W. from the lighthouse; there is also a patch of 2¼ fathoms on the eastern edge, S. by E. nearly 3 miles from the lighthouse. The bank is steep-to, and in places with strong winds the sea breaks. From the depth of 5 fathoms at the south end, San Antonio point bears N. ¼ E., distant 4¾ miles; and at one mile southward of it the depths are from 17 to 20 fathoms; nearly the same depths will be found one mile from its eastern side, decreasing to 6 fathoms close to the bank.

In fine weather and smooth water, vessels of about 15 feet draught constantly pass over the bank, but it is dangerous with southerly winds and any sea. The north end is nearly a mile from the green rocky point next east of the cape, with a channel between carrying from 4½ to 9 fathoms.

Buoys.—San Antonio bank is marked by two buoys placed on its north and south extremities. The northern buoy is black, and lies in about 5 fathoms water, about three-quarters of a mile S.S.E. from San Antonio lighthouse. The southern buoy lies in about 7 fathoms, 4¾ miles S. ¼ W. from the lighthouse. These buoys are not to be depended upon.

Rock.—A sunken rock, having 9 feet over it at low water, lies N.W. by W. from the lighthouse on San Antonio point, distant 2½ cables, and is marked by a spherical buoy.

Winds.—During the northerly monsoon, between the parallel of 10° and 13° S., the winds have a daily variation. At night the land wind is seldom felt outside the reefs; but at the approach of day it freshens and unites with the trade wind, which inclines to the northward until noon; after that hour the wind veers again to the eastward, making an angle of about two points between that of the morning and that of the evening, which a vessel in working to the northward should take advantage of.

CHAPTER IV

BAHIA TO RIO DE JANEIRO.

Variation in 1893.

Bahia - - -	11° 0′ W.	Rio de Janeiro -	5° 30′ W.
Espirito Santo Bay	8° 40′ W.		

BAHIA or SAN SALVADOR.*—The entrance to Bahia de Todos os Santos, or bay of All Saints, 4¾ miles wide, is formed on the east by San Antonio point, and on the west by Itaparica island. The bay extends to the northward for 25 miles, and its greatest breadth is about 20 miles, having sundry islands at its head, with several rivers running into it. As a place of call for vessels in want of repairs or supplies of any kind, Bahia is very convenient; it is healthy, and easy of ingress and egress, without the aid of a pilot; nor does there appear any difficulty of vessels getting to the southward from this port, on account of the tendency of the winds from that direction from March to September, as they generally draw well to the eastward and more so when farther to the southward. The province of Bahia contains 39 towns, with a population (1889) of 1,769,269.

The town of Bahia or San Salvador, the capital of the province, was founded by Thomas de Souza, 1549, and stands on elevated land on the eastern side of the entrance to the bay, about 2 miles north of San Antonio point. It is built on the ridge and declivity of the land facing the anchorage west of it, and consists of an upper and lower town. The Cidade Alta, which includes the suburbs of Bomfim and Victoria, contains several fine streets, where the principal merchants reside. The Praya or Cidade Baxa consists principally of one street

* *See* Admiralty charts:—Bahia de Todos os Santos, No. 540, scale, $m = 1{\cdot}1$ inches; plans of port of Bahia, No. 506; scale, $m = 3{\cdot}8$ inches; and on chart, South America, East Coast, No. 529; scale, $m = 0{\cdot}5$ of an inch.

of considerable length, and contains the magazines and warehouses for inland produce and foreign goods. Here there is a naval arsenal.

The public buildings are, the cathedral, in the upper town, built of marble, and said to be the handsomest building of the kind in Brazil; several churches, the palaces of the archbishop and governor, an ancient college, now the military hospital and a medical school, the town-hall, the tribunal of appeal, the theatre, several hospitals, a bank, exchange, &c.

The town and shipping are defended by several forts. The first is that on San Antonio point; a little northward are Santa Maria and St. Diego; at the south-west extremity of the town is fort Gamboa, with that of San Pedro, and farther on the insulated circular fort San Marcello do Mar, protecting the naval yard. There are other smaller batteries along the beach, and one on Mont Serrat point. On the land side the town is defended by forts and other fortifications. Numerous tramways intersect the town.

The commerce of Bahia consists chiefly in the exports of sugar, cotton, rum, tobacco, coffee, cocoa, hides, &c.; and the imports, of manufactured articles, flour, salt, iron, glass, wines, &c. In the year 1889, 534 steam vessels amounting to 941,796 tons entered and cleared, and 190 sailing vessels equal to 82,121 tons entered and cleared; and in the same year the value of the imports amounted to £2,313,954, and the exports to £1,115,351. The population of the town and suburbs is about 172,000, of whom about 100,000 are mulattoes and blacks.

BANKS.—Baixo Grande.—The principal passage into Bahia is 2½ miles wide, between San Antonio bank, on the east, and Baixo Grande and other reefs, extending from 1½ to 2½ miles south-eastward from Itaparica island, on the west. The water is generally deep; the fairway to the entrance has from 13 to 20 fathoms, and this latter depth will be found at nearly 2 miles westward of the town; from thence to Baixo Grande, the depth is from 17 to 25 fathoms, decreasing suddenly on the banks to 1½ and 2½ fathoms, with overfalls. Westward of the banks the water deepens to 8 and 10 fathoms.

Gamboa bank, or Ciudad, skirts the shore in front of the town; a patch of 1½ fathoms on the outer edge, at the distance of 3 cables N.N.W. ¾ W. from fort Gamboa, is marked by a red buoy in 2¼ fathoms at low water. Many vessels have grounded on this bank.

Panella bank.—Westward and north-westward of fort S. Marcello do Mar, a rocky bank named Panella, with 3½ fathoms on its western edges, extends for nearly one mile. A black buoy lies on the bank N.W. by W. ¼ W., distant three-quarters of a mile from the fort; a red buoy N.W. by W. ¾ W., one mile from the fort; and a black and red horizontal striped buoy marks a ¾-fathoms patch on its northern edge, bearing N.W. by N. distant ⅔ of a mile from the fort. These buoys are not to be depended on. There is good anchorage, according to draught, all round it. At half a mile N.N.E. ¾ E. of fort do Mar is the sunken wreck of a large French vessel burnt in 1856, marked by a buoy. Between the wreck buoy and the French packet moorings northward of it, is a bank about 3 cables in extent, with a depth of 2¾ fathoms.

Anchorage.—The anchorage for vessels of war is off the public garden, in 9 fathoms, muddy bottom, at about three-quarters of a mile from the shore, with fort do Mar bearing about E. by N., and fort Mont Serrat N.N.E. ½ E.: or if convenient a little nearer in. The Brazilian vessels of war anchor nearer the arsenal. Vessels moor in the direction of the tide, parallel to the coast, N.N.E. and S.S.W. Merchant vessels on first arrival generally anchor about one mile south-west of fort do Mar, until visited by the proper officers, when the hatches are sealed, and a berth in the discharging ground is pointed out for them to remove to. The discharging ground is between two imaginary lines running W. by S. from fort do Mar and the consulate, and extending about a mile off shore. The loading ground is to the northward of these lines.

It is seldom that the prevailing winds during the day will not permit a vessel reaching the anchorage at Bahia without tacking, as the most common are those from east and south-east. In the southerly monsoon only, and principally in the months of July, August, and September, they sometimes veer to the south-west, and cause much sea, particularly at the change of tide; but this does not last long, and happens only at the time of new or full moon.

During the night, the wind is weak, variable, and generally off the land. In the morning, during the fine season, it is from North to N.E., and often fresh, which cools the atmosphere, and after an hour's calm is replaced about 10 or 11 o'clock by the wind from E.S.E. to S.E. In the evening, at sunset it falls light, and at 8 or 9 o'clock it blows in little gusts from the head of the bay until sunrise, when it veers to the North and N.E. and freshens.

Supplies.—Vessels will find at Bahia the means of providing for all their wants, but, with the exception of fresh meat, vegetables, and fruit, the charges for everything are high, particularly for naval stores. Water may be obtained between the town and fort Gamboa under the public garden, at other places, and by tank-vessels if arranged for. The market is about midway between the custom-house and consulate near the water side, and well supplied with poultry, fish, fruit, vegetables, &c. Wood for fuel is abundant.

In the fine season, vessels can refit and repair at the usual anchorage. Lighters built for the purpose, with every necessary for heaving vessels down, are moored in-shore of the loading ground, and a vessel 2,400 tons has been hove down here.

Coals can be obtained in large quantities. During the year 1889, 66,972 tons of coals were imported. About 8,000 tons are kept in stock. Vessels are coaled by lighters at the rate of 200 tons per day and at the rate of 300 if working also at night. Between April and August southerly gales prevail, which cause a sea in the anchorage.

Patent slip.—Northward of the town, in Tapagipe bay, there are merchant yards, and a patent slip, where vessels can be repaired at all times of the year.

Communication.—Several lines of railway connect Bahia with other parts of Brazil. Three lines of British steamers call here; also French, German, American, Spanish, and Brazilian steamers, 12 lines in all. Mooring buoys are set apart for them north-eastward of fort do Mar.

Electric cables.—A submarine cable in connection with Europe, is laid with Mont Serrat point just open of San Antonio point; and another leads northward and eastward of San Antonio bank.

LIGHTS.—A *flashing* light is exhibited from San Antonio point, described on page 95. Also a *fixed red* and *green* light is exhibited on fort Sta. Maria, one-third of a mile northward of San Antonio, visible about 5 miles; shows *red* northward of S. 79¾° E., *green* southward of that bearing. A fixed *red* light from fort S. Marcello do Mar, visible 4 miles.

A small *red* light is shown from near the Custom house. A *fixed* white light is shown from Mont Serrat point, at an elevation of 18 feet above high water.

A fixed *red* light is shown from Nossa Senhora do Gaudalupe, south point of Frade island, and should be visible from a distance of 9 miles.

Tides.—It is high water, full and change, at Bahia, at 4h. 26m., and the spring rise is 8 feet. The flood runs 5 hours to the north-ward,

and the ebb 7 hours to the southward. The velocity of the tide is about 1½ miles an hour, increasing to 2¼ and 3 miles during springs.

Directions.*—Vessels bound for Bahia from March to September should make the morro San Paulo (*see* currents, page 30), and then steer to the northward. The dark land of San Salvador is strongly contrasted with that of Itaparica, the former having darker and denser foliage. Victoria church will be the first object seen on the land, and soon after the white lighthouse on San Antonio point will be seen on a dark background. Approach the lighthouse between the bearings of N.N.E. and N.E., and bring the convent of Bomfim, a conspicuous object situated on the top of a hill about half a mile to the north-east of Mont Serrat point, just open of fort St. Maria, bearing N.N.E. ½ E., and steer for it, which will lead up to the man-of-war anchorage. Mont Serrat point, open of Fort St. Maria, will also lead well to the westward of San Antonio bank in about 11 fathoms water. Vessels proceeding northward of man-of-war anchorage, should keep well to the westward of the buoys on Panella bank.

As the strong sea breezes force the waters into the bay northward of morro San Paulo, a vessel sighting that light should not bring it to bear southward of S.W. ½ W. nor approach Itaparica island nearer than 11 or 12 fathoms water; westward of Bahia it will be safe to stand only about half-way across.

From October to January, the coast should be made about 10 miles northward of Itapuan point, where there is a large building like a factory close to the beach, and a lighthouse, close-to on Piraboca rock (page 95). Or if from the northward, when on the parallel of 12° 30′ or 12° 40′, at about 20 to 25 miles from the land, a hill of moderate height will be seen above the horizon, and nearer the coast a series of white sandy downs interspersed with dark verdure. The sand-hills to the north-east of Itapuan point form a good mark for making the land to the northward of Bahia; they are of white sand interspersed with dark patches of brushwood, and on a clear night may be seen from some distance. Continuing along the coast at the distance of 3 or 4 miles, a vessel will pass several other downs and Itapuanzinho point, remarkable by the cocoa-nut trees

* The signal B.N.W., Commercial Code, denoting "Where from," is made to vessels approaching Bahia, by small flags, from a cruiser off fort Gamboa. Should this be not immediately answered, a gun is fired to enforce attention, and repeated with very little delay, if necessary. As a fine of £2 is imposed for each gun fired, vessels are recommended to approach Bahia, with a signal flying indicating their last port of call.

on it, and where the coast trends westward. Here the shore may be approached nearer.

Northward of San Antonio bank.*—The land in the vicinity of San Antonio point will first appear like detached trees, until a mound like a round island rises. Steer along the coast to the westward at a distance of 2 or 3 miles. San Antonio point will open when bearing about W. by N. ½ N., and when it bears N.W. ½ W. steer for it. When 1½ miles from the lighthouse, and about half a mile from the shore, keep at that distance from the latter, make allowance for the tide, and a vessel will pass the north end of San Antonio bank, marked by a red buoy, and may haul round fort San Antonio, and not less than 3 cables distant, for the anchorage. Between San Antonio and fort Sta. Maria, the coast should not be approached within 5 cables, to avoid the 9-feet rock nearly 3 cables from the shore, northward of which at one-third of a mile from the shore, there is not less than 7 fathoms.

A sailing vessel leaving Bahia with a southerly wind and bound to the northward will find the north channel convenient, as it saves a beat to the southward of 5 or 6 miles; but she should have a commanding breeze and make full allowance for the flood tide, which at times sets with great velocity towards San Antonio bank. The land wind generally fails or falls light under the high land of San Antonio point.

Southward of San Antonio bank.—The usual course is round the south end of the San Antonio bank, with mount San Amaro, the highest hill on San Amaro island, in line with Morro Conceiçaõ, the first hill in the plain of Conceiçaõ, on Itaparica island, bearing N.W. by W. ½ W.; (mount San Amaro is a saddle peak, the two parts of the saddle being of equal height; mount Conceiçaõ is a round hill with trees on its summit). The bank should not be approached into less than 12 fathoms water; and the distance of at least 5 miles from the cape should also be carefully estimated and a lead kept constantly going. When Mont Serrat point is seen open of fort St. Maria, bearing N.N.E., a vessel will be three-quarters of a mile to the westward of the bank, and may steer for the anchorage as before directed.

In working, do not stand farther eastward than to bring the church of Bomfim in line with cape San Antonio, nor to the westward nearer Itaparica island than about 2½ miles. Jaburu point, the east extreme

* This channel is not recommended, except in fine weather, and with the buoy on San Antonio bank in sight and in position.—Consular Report, part IX., 1884.

of the island, mount San Amaro, San Antonio point, &c., will be easily recognised. In approaching the parallel of the lighthouse especial care should be taken not to stand too far westward, as the channel is narrowed to 2½ miles, and several vessels have grounded on Baixo Grande and the banks to the south-eastward, by standing too close to point Nª Sª da Peña. The reefs are not always indicated by the breakers, as in fine weather and at the moment of high water the sea sometimes does not break.

Rivers.—The principal rivers which fall into Bahia de Todos os Santos are the Serigi or Sergipe, navigable 9 miles above its mouth, the San Francisco, and the Para Guassu the largest, which irrigates the land in its vicinity, and is known by its richness and fertility. The source of the Para Guassu is in the serra da Chapada, and after several falls it passes the town of Cachoeira and empties itself into the north-west part of the bay. It is navigable to the above town at 54 miles from its mouth. The marshes of its banks are often inundated, which cause intermittent fevers; the water is not good for drinking, and should not be used for several days after it is procured.

ITAPARICA ISLAND, on the west side of entrance to Bahia, is about 16 miles in length, N.E. and S.W., and 4 miles across. It possesses a good soil, supplies the market of Bahia with a great portion of its fruit and vegetables, and the interior abounds in cocoa trees, producing fruit of a large size and forming an important article of trade; there are also manufactories for rope and other articles. The island is divided into two parishes, has several churches, and its population may be about 20,000; the principal town and general mart at the northern end is defended by a fort.

Jaburu point.—On the east side, opposite the town of Bahia, are numbers of handsome looking houses. Jaburu point, the east extreme of the island, is bordered by extensive reefs with 8 to 12 fathoms water close to (*see* page 98); between which and the anchorage at Bahia the water deepens to 20 and 25 fathoms, soft muddy bottom. The south-east shore of the island is skirted by reefs, and from Caixa Pregos point its south end, the rocks extend off about 2¾ miles, with broken water, and a set towards Jaguaripe bar is generally felt, rendering an approach nearer than 5 miles dangerous.

ITAPARICA CHANNEL.—Jaguaripe river.—The western entrance to Bahia is the Itaparica channel, formed by Caixa Pregos point, the south-west extreme of Itaparica island, and Garcia point on the main land. It is said to be narrow, tortuous, shallow, and not

easily distinguished, but is frequented by small vessels and coasters acquainted with its navigation. The river Jaguaripe has its source about 33 miles westward of the town of Cahoeira, and is navigable with the tide, about 22 miles above it mouth.

Reefs.—Eastward of the channel is the Barra Falsa, a small inlet of the island between Aratuba and Caixa Pregos points. A coral reef lies off the coast at the distance of 2½ miles. Aratuba point, at a distance of more than 14 miles, has a similar form to that of cape San Antonio, appearing like the latter to detach itself from the land westward of it. The whole of this part of the coast is bordered with shoals and rocks, and in places from the depth of 10 fathoms, the water shoals rapidly. A vessel getting into less than 11 fathoms water should tack immediately.

COAST.—Between Bahia and the Itacolomis the coast is of moderate height, composed alternately of sandy beaches, woody hillocks, and sometimes of reddish cliffs from 65 to 165 feet high. In the interior, mountains whose summits range from about 1,600 to 2,000 feet high, but which, from their remoteness from the sea, appear from the offing above the horizon like isolated hills, are seen a little sooner than the coast.

La Serra Grande, in lat. about 14° 30′ S. between Ilheos and Contas, is the only group of mountains near the sea. The coast can be seen at a distance of 21 to 27 miles, according to the locality and the state of the horizon. The mouths of the rivers will be known by the breakers on the bars, which extend off from one to 1½ miles. The remarkable points, in the absence of other observations, which serve to fix a vessel's position, are the morro San Paulo, the paps of Boypéba, Quiepe isle, the high dark cliffs of Contas, the Serra Grande, Ilheos, the mountains of Commendatubu, the red cliffs of Porto Seguro, and lastly mount Pascal.

The water all along this portion of the coast is deep, and at 2 miles from the shore there are from 11 to 16 fathoms ; but in proportion as we advance to the southward the soundings diminish a little. The nature of the bottom is nearly the same at 2 or 3 miles from the shore ; a mixture of sand and gravel, or coral and broken shells ; a little mud is found near the mouths of some of the rivers, but this is rare.

There are coral banks in four different places, at 2 or 3 miles from the coast, viz. : between Bahia and the morro San Paulo, eastward of Itaparica channel ; Boypéba and Camamú ; the Ilhéos ; and between

Santa Cruz and Porto Seguro. With the exception of these four places, the coast is safe, and a vessel may approach in moderate weather to a distance of 1½ or 2 miles, in 6 fathoms water.

MORRO SAN PAULO.*—From Garcia point, the south point of entrance to Itaparica channel, a low, sandy coast, bordered with reefs, trends to the south-west and south for about 15 miles to the entrance of the river Una, and forms a deep bay. The south-east side of the entrance to the river is the north extremity of Tinharé island, named Morro San Paulo, a high, rugged, conspicuous headland projecting to the north-east and terminating in a nearly perpendicular cliff, with low land to the back and northward of it. On the summit of the cliff is a lighthouse, and at the extreme point of the base are the ruins of an extensive fort.

The land southward gradually declines in height, and at half a mile south-east of the battery is a low islet; outside it at the distance of 3 cables, is the north end of a reef of rocks, which skirts the coast to the southward, steep-to, and on which the sea breaks heavily. The shore, north-west of the Morro, forms a deep inlet easy of access, and affords shelter for a large number of vessels. At about 2 miles within is the village of Gamboa, and about 7 miles up the river, on the north bank, is the town of Valença, a thriving place, having a population of 5,000, and in weekly communication with Bahia. The Una has many branches, with several small towns on their banks, and is navigable some distance for small steamers.

Joao Goncalves bank.—The entrance to the inlet north-west of the Morro, is contracted to about three-quarters of a mile in width by an extensive sand-bank bordering the low western shore at the distance of 2¼ miles; and at 1¼ miles southward of the Morro, the channel is narrowed to about 2 cables. The bank, on which the sea breaks, shoals gradually at the northern part, but is steep-to farther in, where the water suddenly shoals from about 4½ to 1½ fathoms; its south side is partly dry. At about 1½ miles S.W. by W. from the Morro, its edge trends to the westward; it is steep-to, and terminates at the western point of entrance.

Channel.—The eastern shore of the channel immediately within the Morro is steep-to; at the distance of about half a mile to the south, a bank commences and borders the shore to the southward at

*See Admiralty plan:—Morro San Paulo anchorage; scale, *m* = 0·9 of an inch, on chart, No. 529.

about one to 2 cables; in the south-west part of the inlet it trends to the northwards, leaving a passage about half a mile wide between it and the low western point of the inlet. Water may be obtained here in small quantities. Near Valença is the beginning of a natural canal, which at high tide admits boats to navigate as far south as the river Jiquié, which has its outlet southward of Tinharé island.

LIGHT.—On the high cliff at the northern extremity of Morro San Paulo is a lighthouse 80 feet high, painted white, which exhibits at the height of 276 feet above high water a *revolving* white light, visible in clear weather from a distance of 20 miles. The light revolves *every minute*, showing a bright light for *fifteen seconds*, followed by an eclipse of *forty-five seconds*.* At a distance less than 8 miles the eclipses are not total. Sometimes, when the lighthouse is first seen above the horizon, it appears like a vessel under sail.

Anchorage.—Anchorage will be found at half a mile south-west of the Morro, or anywhere off a red cliff south-west of the village in 5½ or 6 fathoms water; and, if necessary, a vessel can go higher up—where there is plenty of room for a large number of vessels—by steering along the southern shore. Vessels for the river should take a pilot. In working out with the ebb tide, a vessel should not stand too near the coast of the Morro.

Tides.—It is high water, full and change, in Morro San Paulo inlet at about 4h. 0m.; and the rise is 6½ feet. The ebb is much stronger and lasts longer than the flood; it sets rather towards the Morro point, along the coast by the old batteries, at the rate of one to 2 miles an hour, and sometimes 3 to 3½ miles.

Directions.—Vessels from the northward, bound for the anchorage of Morro San Paulo, should keep Bahia light bearing northward of N.E. by E. (the line joining the two lights), and not stand into less than 11 or 12 fathoms. When between 2 and 3 miles eastward of the Morro light, bring it to bear about S.W. and steer in with the light a little on the port bow, gradually rounding it at a convenient distance, avoiding Joao Goncalves bank extending from the western shore. In working in at night, a berth should be given to the reef south-east of the Morro, as there are 8 fathoms water close to it.

* Reported irregular.

The least depth in the fairway between the Morro and bank on the western shore is about 5½ fathoms at low water, increasing to the south-west, in places to 12 and 18 fathoms.

The COAST.—At about 30 miles southward of Morro San Paulo is Muta point, the east extreme of a deep bay. From the Morro the land declines in height to the southward, and at the distance of 5 or 6 miles is Crapoa point, low and covered with dark green vegetation, by which it will be easily known ; at 2 miles farther south is the little village of the same name, which is seen when passing near the coast. This part of the coast can be approached to the distance of one mile in 6 or 7 fathoms water, sand and broken coral. Southward of Crapoa the coast is still lower, being a wooded plain as far as Boypeba island ; the shallow water of 2½ and 3 fathoms, does not admit vessels to approach nearer than 2 or 3 miles.

The land between the Morro and Boypeba island, is that of Tinhare island, separated from the continent by a deep canal, which connects the river Jiquie with the river Una and the port of the Morro. Two little rivers here run into the sea, but they are of no importance. The delta of the river Jiquie forms two other islands, one named Tupiassu lying between Tinhare and the continent, the other Boypeba.

BOYPEBA or AS VILLAS ISLAND.—About 15 miles southward of Morro San Paulo, at the extremity of a wooded plain, is a group of low wooded hills appearing detached from the coast ; this is Boypeba island, named also As Villas from its appearance : the land north and south of Boypeba is very low, by which the island will be known. The coast of Boypeba is bordered by a chain of reefs, which from the south-east point of the island named Castellanos, extends a mile from the land. At 2 miles from the point the depth is 7 fathoms, sand and coral.

At night, a vessel should not approach nearer than 11 fathoms water, as the soundings diminish rapidly. A little northward of Castellanos point there is a small village near the mouth of a stream ; small coasters approach tolerably near the reefs. On the north-west side of the island, on the borders of the canal which separate Tupiassu island, is the village of Boypeba Velha. The island is well cultivated, and carries on a small trade with Bahia. From Castellanos point is seen the lighthouse of Morro San Paulo to the northward, and Quiepe isle to the southward.

Barra Carvalhos.—From Castellanos point the shore of Boypeba island trends to the westward, and forms at a distance of 4 or 5 miles a right angle with the coast of Camamu running north and south. Here at the head of the bight is the entrance to the canal which communicates with the river Jiquie, the interior, and port of Morro San Paulo. This entrance is named the Barra Carvalhos, and will be known by the hills of Boypeba and the low land of the continent.

South-west of Boypeba island is a small conical, isolated hill, and on its summit are cocoa-nut trees which from a distance appear as one; they can be seen 11 or 12 miles off, and are useful as a mark for this part of the coast. Barra Carvalhos is practicable only for coasters of about 6 feet draught. Its approach is encumbered with large patches of coral, and local knowledge is necessary.

The Coast between Boypeba and Camamu forms a bay 4 or 5 miles deep, terminating to the southward by the extensive reef named Sororo Cussu, which surrounds Quiepe isle. This bay is shallow, encumbered with detached banks of coral, and cannot be navigated without a pilot. The shore is low, being a long beach of sand with no object to mark it. Vessels bound to the southward should give Boypeba island a berth of at least 2 miles, and not approach the land until abreast of Quiepe isle.

In approaching the coast on this parallel, there is no high land to mark the entrance to Camamu; but when about 15 miles from the land there will be seen in the north-west the wooded hills of Boypeba, in the west Quiepe isle, which appears like a group of trees divided into two parts, and the low point of Muta with a group of cocoa-nut trees on it. On a nearer approach the two low hills of Taïpus, on the coast, at 4 or 5 miles south of the entrance to the port, will be seen.

CAMAMU,* in lat. 13° 51′ S., long. 38° 59′ W., is one of the best ports on this part of the coast of Brazil, on account of its extent, depth, and shelter. Between Muta point and Sororo Cussu reef extending from Quiepe isle, is the entrance to Barra da Enseada, which extends to the south-west to the confluence of the rivers Acarahi and Marahu. The town of Camamu, defended by a fort, stands on the left bank of the Acarahi, about W. by S., 10 miles from the bay. It trades with Bahia, exporting coffee, spirits, rice, &c., and

* *See* Admiralty plan:—Port of Camamu, No. 549; scale, *m* = 2·5 inches: also plan, scale, *m* = 0·6 inch, on Admiralty chart, No. 529.

is in telegraphic communication with that place and Pernambuco. The population is about 2,000.

Marahu village is about 14 miles up the river of that name, and has a population of about 2,000. Vessels drawing 18 feet have been as far as the factory, 12 miles up the river.

The navigable part of the port of Camamu is much contracted on the north by the reef and bank surrounding Quiepe isle, which extends to within a mile of Muta point. At 1½ miles west-north-west of the point are two rocky banks with about 10 feet water on them. The port has from 3 to 9 fathoms water, and this latter depth will be found in the entrance of the Marahu. An islet, with several rocks, lies at the entrance of the Acarahi.

The entrance of the river Serinhaem is in the north-west part of the port, but it is of no importance, being navigable only for boats.

Muta point.—Rocks.—Muta point is low, sandy, and has a group of cocoa-nuts on it, which are clearly seen from the offing; it is clear of danger on the east and north sides, but W.S.W. distant 3 cables from its extreme, is Sioba rock, with about 2 feet on it at low water; and at 1½ miles south-west of the point, and about 4 cables from the beach, are the Itaipebus rocks, which dry at low water, with breakers nearly 2 cables north, and a shallow patch which occasionally breaks, about half a mile east of them. A little west of the point is a low hill, and one mile within is the village of Barra Grande, consisting of about 20 houses.

Quiepe isle, about 330 yards in diameter, lies on the north side of entrance to Camamu, and is covered with large trees reaching 155 feet above the level of the sea, visible at a distance of 14 miles, and easily known by its isolation from the main land westward, which is lower. It is surrounded on all sides by coral banks, the Sororo Cussu, extending one mile to the southward, 1½ miles eastward, and 2 miles east-north-eastward, and which narrows very much the entrance to Camamu; the sea breaks all over the banks when the wind is fresh from the offing, and particularly when the tide is contrary to the wind.

Pragonas and **Carocos banks.**—These rocky banks lie from 6 to 7 cables north-west of the anchorage, at 1½ to 2 miles W. by N. ½ N. of Muta point. The banks together are about three-quarters of a mile in length east and west, with 10 feet on them at

low water. The town of Camamu shut in with point Pedreira the north extreme of Camamu island leads southward of the banks.

Bank.—At the distance of half a mile N. ½ E. from Itaipebas rock, and in mid-channel, there is a bank with a depth of 18 feet. As this bank is nearly on the leading mark, care must be taken in proceeding westward of the outer anchorage to bring Camamu church midway between Pedreira point and Cavallo rock. At 1½ cables north of this bank there is another bank (Dawes bank) with 18 feet, but of greater extent.

Cavallo rocks.—At half a mile northward of Pedreira point is a group of rocks, some of which are several feet above the sea; the highest has some resemblance to the head of a horse, from which it takes its name.

Barra Camamu.—Between Cavallo rocks and the coast is a channel having 1½ to to 3 fathoms water; and there is a depth of from 2 to 3 fathoms between the rocks and Pedreira point. The latter channel is used by vessels bound to Camamu and is named Barra Camamu.

Camamu island, in the inner part of the port, is 3 miles in length north and south, and 2 miles in breadth. It is hilly, higher than the neighbouring shore, and divided into three or four parts by narrow channels, but which are not even navigable for boats. The east side of this island forms the left bank of the river Marahu.

The small village of Campinhos stands on the east shore of this river, at about 1¼ miles southward of Pedreira point, and here the depths are 7 and 8 fathoms, and the river half a mile wide.

Rio Marahu runs nearly in a south direction, with the exception of one or two bends, until abreast the town of Barcellos, when it turns rather sharply to the south-east, thence southerly 1¾ miles to the Marahu oil works at about 8 miles from the entrance. The village of Marahu is about 2 miles beyond the oil works, and has a population of about 2,000. The river is navigable for vessels of 18 feet draft; pilots, however, cannot be trusted for more than 9 feet draft.

Rio Acarahi.—The mouth of this river is formed by Camamu island and the main land. It descends from the chain of the Aymores, and is navigable about 20 miles above the entrance. On its banks numerous sawyers are employed cutting timber, which is conveyed by the river to Camamu for Bahia.

From Barra de Camamu, the water within deepens to 8 and 11 fathoms, when it again decreases. The river is much obstructed by shoals and should not be entered without a pilot.

Anchorage.—Anchorage will be found in port Camamu in about 6 fathoms water, sandy bottom, a short mile westward of Muta point, or farther to the south-west. It is necessary to ascertain the position of the bottom before anchoring as there are several patches of rock.

There is anchorage farther in, off Campinho point in 3¼ fathoms, at half a mile from the shore, care being taken in proceeding to it, to avoid the 3-fathom patch situated nearly on the leading mark. Coasters anchor on the bank off Barra Grande. If it be necessary to go westward of Campinho point, the services of a pilot should be obtained at Barra Grande as there are many dangerous rocks in the way.

Supplies are tolerably cheap and plentiful, water is bad and scarce, firewood of an indifferent quality is abundant.

Fresh meat and vegetables can be procured from the village of Marahu by communicating with the agent at the oil works and giving a day's notice; fish are plentiful, but difficult to take even with a seine.

Tides.—It is high water, full and change, in port Camamu at 4h.; springs rise about 6½ feet. The tides are tolerably regular. The stream of the ebb, increased by the waters from the rivers which fall into the port, is much stronger than the flood; its average rate is from 1½ to 2 miles an hour, and sets towards Quiepe isle and reefs. When the wind is fresh from the offing the ebb causes a heavy sea across the whole breadth of the entrance between Muta point and the Sororo Cussu reefs.

Directions.—When bound to port Camamu, if from the northward, keep from 2 to 3 miles eastward of Boypeba island, until on the parallel of Quiepe isle, and in not less than 8 or 9 fathoms water; this precaution is necessary as the swell from the offing, and the current, set on the reefs, and towards the bay to the northward.

When about E.N.E. of Muta point, and having it in sight, the hills, the rocks off Pedreira point, and the north end of Camamu island, will soon be seen, also the town of Camamu at 10 or 11 miles inland, standing on rather higher ground. Then bring the town touching

Pedreira point, bearing W. by S. ¾ S., and steer for it, which will lead a vessel in mid-channel nearly half a mile northward of Muta point, and a greater distance southward of the edge of Sororo Cussu reefs.

If the town of Camamu be not visible, a vessel may steer in and pass 4 or 5 cables northward of Muta point; and then steer for Pedreira point bearing W. by S. ¾ S., and anchor in 5½ fathoms water, fine sandy bottom, on, or to the southward of that bearing, at one mile from the beach of Barra Grande.

If proceeding to the anchorage off Maharu oil works; after passing Pedreira point keep in mid-channel until abreast Langdon point at 2¼ miles south of it, then haul gradually towards Mitchell point on the opposite shore, being careful not to shut in Pedreira with Sandy point, until abreast Mitchell point. There are depths of 8 to 13 fathoms just south of Mitchell point, but the water shoals suddenly to 6 feet within one or 2 cables of the shore; after passing this point, Bare hill an islet 2¼ miles further south, bearing S. by W. ¾ W., will lead in mid-channel until abreast White house on the eastern shore, when a more westerly course should be steered until Barcellos town is seen open of High land (an islet just south of Bare hill) when a S.W. ¾ S. course will lead in mid-channel to abreast Beatty point, thence haul gradually around to the eastward, keeping tolerably close to Anderson point where the depths are 9 and 10 fathoms, thence steer across for Four Cocoa point on the eastern shore, and when the oil works are seen steer to the southward nearly in mid-channel, borrowing a little on the eastern shore, pass west of Palm islets and anchor in about 3 fathoms water, at 2 or 3 cables from the shore. There is a creek leading to the factory, having at its mouth a bar; vessels with about 12 feet draft could pass over at high water, the rise of tide being about 8 feet.

In leaving the port advantage should be taken of the land wind. Bring the town of Camamu touching Pedreira point, and steer out E. by N. ¾ N. until a sufficient offing is gained. In working out with the sea breeze, as the channel is narrowed by Sioba rock and Pragonas bank, the strength of the ebb tide, which sets out of the bay towards Sororo Cussu reef, should be taken into consideration, and a vessel should tack short of a line passing through the town of Camamu and Cavallo rocks.

In standing to the southward, do not shoal into less than 3½ or 4 fathoms water, with the town of Camamu just shut in with Pedreira point. With a fresh breeze from the offing and ebb tide, the sea

resembles a line of breakers across the entrance of the bay. When clear of the port, and the route is to the northward, a vessel should steer 4 or 5 miles eastward of Quiepe isle, to avoid the set, swell, and shallow water in the bay north of that islet.

The COAST from Camamu trends in a southerly direction 25 miles to the entrance of the Rio Contas, and is low, sandy, and covered at intervals with patches of vegetation and groups of cocoa-nut trees; it is clear of danger, and can be approached to a distance of one or 1½ miles, in 6 or 8 fathoms water; at 3 miles distant the depth is 14 fathoms, sand and broken shells. Off the coast between Camamu and Contas, the two low hills of Taïpus are seen. The interior land is a little elevated, and offers no conspicuous object but the summits of Serra Canastra, a small chain of mountains at 10 miles from the sea.

This coast is named Terra d'Algodon. The only opening on the shore is the Barra de Marahu about 18 miles south of Muta point; small coasters, when the tide is favourable, communicate with Camamu by this passage.

CAPE TROMBA GRANDE.—At some miles southward of Camamu the low coast terminates in a peaked cape, and in the distance are the summits of the Serra Grande de Contas. Cape Tromba Grande is a remarkable cliff of black rocks, 328 feet high, and an excellent mark for Rio de Contas, of which it forms the south side of entrance, and is the beginning of the high land which extends south to Serra Grande.

At one mile north-north-west of Tromba Grande, is another cape equally bold, but less elevated, and forming the south point of entrance to the river Trombina; the north point of entrance is a low shore bordered by sand banks. The mariner wishing to make the land in this vicinity need have no doubt as to its identity.

RIO de CONTAS rises in the Serra da Tromba, flows to the eastward, and falls into the sea about 250 miles from its source. The ancient name of this river was Jusiape, when its banks were inhabited by the Patanos Indians. It is of little importance. and interrupted by numerous cataracts, but navigable for large canoes about 15 miles above its mouth, except immediately after heavy rains, when the stream is too rapid. Its waters are said to be excellent for tempering steel, and the river is celebrated for gigantic

bones (probably those of the mastodon) which have been found in the ravines near its banks.

The mouth of the river forms a basin, and can be seen from the offing; it opens to the north-east, being covered to the east by the high land of Trombina point, and bounded on the west by the low coast and the sand-banks which obstruct three-quarters of its entrance, leaving only a narrow channel close to Trombina point. The depth of this channel is 8 feet at low water, and 14½ feet at high water. When the sea is smooth it is easy to enter; the mark for going in, is the point north of Shere reef in line with the church, bearing about W.S.W.; the water diminishes on the bar near the point, and then rapidly increases in the basin to 5½ and 6½ fathoms.

The high land south of the entrance is covered with trees, and the town of the same name stands in the bend of the coast at one mile south-west of the entrance to the river; it is masked from the offing by Trombina point until it bears southward of W.S.W.; when open it can be seen at a considerable distance, and is a good guide to the anchorage. It is the chief place of a district containing 3,000 inhabitants; the territory being reputed the most fertile on the coast. Coasters frequent this place for supplies.

At the distance of 5 miles from the coast there is no bottom with 100 fathoms of line, but once in soundings, they are regular to the anchorage.

Anchorage.—Off Contas, near the entrance to the river, there is anchorage in 8 or 9 fathoms water, mud, with cape Tromba Grande bearing S. ¾ W. distant 2 miles; and Contas church S.W. by W. ¼ W. 1½ miles, at about one mile from the Trombina, and one mile N.N.E. of Pedra Branca rock. The depths diminish regularly towards the bar. If necessary, vessels may anchor farther out.

Tides and Current.—It is high water, full and change, in the Rio Contas at 4h.; the stream of the ebb is rapid, averaging 3 or 4 miles an hour in the channel, which requires great caution in entering. During the north-east monsoon, the coast current is stronger in this vicinity than any other part, a vessel bound northward should therefore gain an offing.

Pedra Branca.—There are two rocky banks off the mouth of Rio de Contas; the most distant from the shore is the Pedra Branca, with about 3 feet water on it at low tide; it lies 3 or 4 cables eastward of the Trombina, and does not always break. Vessels should approach the bar from the north-eastward.

Shere reef.—The second reef, nearer the land and N.N.E. of Trombina point, is a large plateau of rocks, uncovered at low water, and always breaks. Its proximity to the shore, and the breakers, render it less dangerous than the Pedra Branca; vessels pass to the north-west of it entering the Contas. The pilots give as the leading mark from the offing, the point north of Shere reef in line with the church, bearing W.S.W., which passes at equal distance the Pedra Branca, and the sand banks bordering the coast on the west.

The COAST from cape Tromba Grande trends in a southerly direction 30 miles to port Ilheos. In this distance it recedes to the west, forming a curve 3 or 4 miles deep; the land between is high, with bluff points and peaked cliffs, steep, and safe to approach. At one mile from the shore there are from 6 to 11 fathoms water, sand and gravel.

At 5 miles southward of cape Tromba Grande, near a bold steep point, the high land receding from the shore for 3 miles forms a deep valley, from the middle of which two streams run into the sea. Between these streams, near the sea, is a small conical isolated hill, at the foot of which is the village of Tejuipe; at 2 miles south of the village is the high peaked land forming cape Serra Grande.

Serra Grande.—The Serra Grande is a chain of mountains extending inland at right angles to the coast, and their two or three principal summits, at 5 or 6 miles from the sea, attain the height of 1,640 feet, and are visible from the offing in clear weather more than 40 miles from the coast; the termination of this chain of mountains presents a sea front of elevated cliffs 10 miles in length north and south.

The north point of these elevated cliffs is 9 miles south of cape Tromba Grande, near the village of Tejuipe. The point in the middle, the most salient, and known as Punta de Serra Grande, is a little north of the parallel of the summits; it is steep-to, and at less than one mile from it there are depths of 11 fathoms, rocky bottom. The south point of the cliffs is named Punta del Ramo, and is 19 miles from cape Tromba Grande. The village of Memouan stands on a narrow neck at the foot of the high land north of Punta de Ramo, but is of no importance.

Rio Itahipe.—Ramo point terminates abruptly the high land of Serra Grande, and then follows the Aba da Lagos valley, 5 miles across, which separates the group of the Serra Grande from those of

the Ilheos. This valley, larger and deeper than that to the north which separates the same group from the high land of Contas, is very noticeable from the offing.

In this valley is a large lake named Itahipe, and a river of the same name runs through it from the Serra Itaraca, and discharges itself into the sea at 3 miles south of Punta del Ramo. At 5 miles southward of this point the low land of the valley is terminated by a bluff reddish point, the commencement of the high land of Ilheos.

St. JORGE dos ILHEOS.*—At 30 miles southward of Contas are two slightly salient points, forming a small bay protected by a chain of islets and reefs, inside which is fair anchorage. In the south part of the bay is the mouth of the river Cachoeira or dos Ilheos, which in its course, close to the sea, forms a peninsula. The south point of this peninsula, 193 feet high, is named Morro da Matriz Velha, and its extreme point Fucinho do Cão (dog's nose).

The right bank of the river is very low, forms a semicircle round this hill, and terminates in an isolated wooded hill 131 feet high, close to the water, named Morro of Pernambuco, the south point of entrance, which being connected to the continent by a neck of land (Praia Zimbo) might at some distance be taken for an island. On the north-west side of this hill are the ruins of batteries which formerly defended the port.

The entrance to the river is between the two Morros, open to the north, and 2¾ cables in breadth, but narrowed by the Coroa Capão, sand-banks deposited by the stream of the river on the western side of the channel which, from 2 cables south-eastward of Fucinho do Cão, extend along the coast, terminating at Rapa rocks lying half a mile northward of the Morro of Pernambuco and 3 cables from the shore of the town. In entering the Cachoeira, a vessel should bring the Morro of Pernambuco to bear about S.W. by S., and round it tolerably close to avoid the breakers on the western shore, where there is always much sea, and especially when the tide is running out against the wind.

Within Fucinho do Cão the river trends northward for about one-third of a mile and then westward. The channel along by Morro Pernambuco has about 10 feet at low water and 16 feet at high water, but it deepens in the river to 6 and 8 fathoms, sand and mud. The

* *See* Admiralty plan :—Anchorage of Ilheos ; scale, $m = 2{\cdot}25$ inches on chart, No. 529.

town of St. Jorge dos Ilheos stands on the north-west side of the Morro do Matriz Velha, where supplies can be obtained at moderate prices. The only trade here is in timber, cut at different distances up the river, and floated down for exportation.

Islets and Reefs.—At about $1\frac{1}{4}$ miles north of the entrance to the Cachoeira, is Pedra Grande point, where the land trends westward and northward forming Trincheiras bay. Parallel to the coast, at about the distance of a mile, are a chain of islets and reefs nearly 2 miles in length. Ilheo Grande or Verde, 62 feet high, and 164 yards in diameter, is the largest and northernmost of the group. It lies at $1\frac{1}{4}$ miles north-east of Pedra Grande point, and $2\frac{1}{10}$ miles N.N.E. of the Morro Pernambuco. It is covered with trees, and can be seen at the distance of about 15 miles.

Ilheo Pequeño or Arido is about a cable south-east of the former, with a passage between. At three-quarters of a mile S.S.E. of the islets is a reef of rocks named Itaïpins, which uncover, and the sea nearly always breaks on them. Itapitanga rock lies South, distant $1\frac{2}{10}$ miles from Ilheo Grande. Sororoca reef is covered, but does not always break; it lies E.N.E. nearly one mile from the Morro Pernambuco, and $1\frac{3}{4}$ miles South from Ilheo Grande. This is the southernmost of the chain, and it forms with the Morro the southern entrance to the outer anchorage.

These islets and reefs have channels of irregular depths between them, which can only be used with safety by boats.

Anchorage.—A good berth for anchoring, is in 5 or 6 fathoms, mud and clay, with the north part of Ilheo Pequeño, the outer isle, just open southward of Ilheo Grande; or a more convenient anchorage for communicating with the village, is farther south, with Pernambuco point bearing about S.W. distant 6 cables.

Directions.—St. Jorge dos Ilheos is known, when on its parallel, by the Serra Grande to the north-west, and the two hills or morros of Pernambuco and Matriz; and on nearing it by a large white church standing about the middle of the ascent of the land, and the islets and rocks protecting the anchorage. A vessel may pass in north of Ilheo Grande, or south of Sororoca reef, according to the prevailing wind. To steer in northward of Ilheo Grande, which is steep-to, pass 2 or 3 cables from it, and anchor when convenient.

In steering in south of the reefs, the Morro Pernambuco bearing W. by N. leads half a mile southward of Sororoca reef; and when

at the distance of half a mile from the land, in not less than 5 fathoms water, steer to the N.N.W., to the anchorage. Vessels in leaving, can pass out north of the islets or south of the reefs, as convenient. The anchorage is most exposed at high water, when the sea passes over the reefs.

In crossing the bar of the river, keep near the bluff south point of entrance: when the wind is fresh from the offing a sea sets in, and breaks across the bar, the channel is then all but impracticable.

Tides.—It is high water, full and change, at Ilheos anchorage, at 4 h.

Rio Ilheos or **Cachoeira** descends from the chain of the Aymores, and runs into the bay of Ilheos, after being divided into two parts about 30 miles above its mouth. Its bed is uneven, which renders it unnavigable beyond 6 miles from St. Jorge, where there is a cataract from which it takes its name. Its principal affluents are the Itape and Santa Anna. Near its borders are found a number of the bones of the mastodon, an extinct animal much resembling the elephant.

The COAST.—At about the distance of 62 miles nearly south from Rio Ilheos is the Rio Grande de Belmonte, with heavy breakers north and south of it. The coast between the two rivers runs about South, nearly straight; the northern part is of average height, formed alternately of wooded hills, small cliffs, and sandy beaches; but south of latitude 15° 20′ the land is low and wooded, with a white sandy beach as far as Belmonte, and backed at about 15 miles inland by the Serras de Itaraça and Commandatuba, which extend north and south for 20 miles, between lat. 15° and 15° 25′.

The northern Serra is 1,902 feet above the sea; the middle one, 8 miles S. by W. of the former, is 2,034; and the southernmost, named the Morro de Commandatuba, 1,968, is an isolated undulating mountain, easily known from the offing, and the best mark for this part of the coast; it is 8 or 10 miles S. ½ E. of the middle one, and 16 miles from the sea, in latitude 15° 21′. These mountains will generally be seen about 36 miles from the offing. All this part of the coast can be approached to a distance of 1½ or 2 miles. Between Ilheos and Olivença there are some small detached banks of coral, extending nearly a mile from the shore; but south of latitude 15° 15′ the coast may be approached to one or 1½ miles in 6 or 8 fathoms water. At 3 miles off there are 17 and 19 fathoms.

Olivença, a small Indian village, about 8 miles south of Ilheos, is built in a picturesque manner on the summit and towards the north of a hill near the sea; the church of Notre Dame Escalier is on the highest part, and looks like a long stone staircase, from which it takes its name. Seen from the offing the village is conspicuous, and appears like a single line of houses descending the hill to the north. Numerous cattle are seen grazing here. In the vicinity, at three-quarters of a mile from the shore, are some reefs on which the sea occasionally breaks. The coast here should be approached with caution. At one mile off there are 5½ fathoms water, and at 5 miles 11 to 14 fathoms, fine sand or sand and gravel.

The coast is broken by the mouths of numerous rivers, which are known when at about a mile from the shore, by the breakers on the bars, and by groups of houses built generally in their vicinity; but they are not of much importance, and, as well as the several villages along the coast, their names are often uncertain. At 3 miles southward of Olivença is the entrance to the Rio Una, with breakers at 2 or 3 cables from the coast.

At 2 and 4 miles more to the south are two other rivers, probably the Jari and the Itapuan; between which is a low salient point, covered with groups of trees. Some Indian huts are sheltered under the cocoa-nut trees. The Rio Aqui, in latitude about 15° 6′, has a small village north of the bar; and at one mile south of it is a bank of coral and sand, which extends off nearly a mile. At a mile from the land the depth is 3½ fathoms, but outside this distance there are 5½ fathoms. The mouth of the Rio Messo is 5 miles southward of the Aqui, and 2 miles north of it are some woody cliffs from about 80 to 100 feet high, with a small triangular white spot, which is very remarkable from the offing.

Rio Una Mirim, about 6 miles south of the Una, has a village north of the bar; and 3 miles south of it is the mouth of another river, probably the Aracari. At 2 miles farther on is the mouth of Rio Muruim, with groups of houses north and south of the bar. Between the latter two rivers is a conspicuous point, where terminates the white sandy beach, and commences the forest bordering the coast. A little to the southward of the Muruim, the hills and cliffs terminate and the low land in the neighbourhood of the Rio Commandatuba begins. In the interior, south of the Serra Commandatuba, the country is a plain.

Rio Commandatuba is a small river (in lat. 15° 28′ S.) descending from the chain of mountains of the same name; the

bar is shallow and accessible only at high water and in calm weather to the smallest coasters. This part of the coast is low, with lagoons extending along the coast a mile inland; these lagoons communicate with the sea, and form low islets, on which are several houses, and the village of Boa Ventura. An Indian village stands at the mouth of the river, and the village of Commandatuba, also peopled by Indians, is 2 miles above the bar. Boats can proceed 2 miles above the village. The German colony Monitz is established on the river.

Rio Poxim, in latitude 15° 35′, admits boats at high water; it communicates with the lagoons, on the north with the Rio Commandatuba, on the south with the Barra Canavieras and the Rio Patype. All along this coast the soundings are 4½ to 5½ fathoms, sand and mud, at one to 1½ miles from the shore; 9 fathoms at 5 miles; 14 fathoms at 10 miles; in the offing the soundings decrease to the southward.

BARRA de CANAVIERAS, or mouth of the Rio Pardo or Patype, in latitude 15° 41′, is the most important southward of Ilheos. The land in its vicinity is very low, but the river is easily known by a white tower on the north point of entrance, and which appears detached from the dark verdure of the coast, especially when the sun shines on it. A sand-bank obstructs its entrance, but at high water there are three different channels, one on the north, one on the south, and another in the middle of the bank; this last is the deepest, which at high tide has from 15 to 16 feet water. Vessels anchor off the port in 5½ fathoms, mud, with the tower about West, distant about one or 1½ miles.

This port is frequented by small coasters, and a bar master is always ready for the service of vessels when they appear off it. The town of Canavieras stands on the left bank. The source of the river is in the province of Minass Geraes, where it divides into branches; one of which, the Rio Cachoeira, disembogues at Ilheos, whilst the other branch, the Rio Pardo or Patype, runs into the sea at the bar of Canavieras. At some miles above the bar the Patype communicates by a natural canal, named Rio Salsa, with the Rio Grande de Belmonte. During the rainy season it forms a second communication nearer the sea by the Rio Jundia-hi.

The Rio Pardo separates the provinces of Ilheos and Porto Seguro. It was between this river and the Rio Grande de Belmonte that the beautiful quarries of rose colour marble were discovered some years ago. The coast southward of Canavieras is low, wooded, and broken

by the entrances into the lagoon, with here and there some small villages of no importance ; they are named Jundia-hi, Porto da Funte, Embarca, Farina, Poço, and the Barra do rio Marineiro. With the exception of the Serras of Commandatuba, which are seen to the north-west, there is no high land, the country being flat and marshy.

RIO GRANDE de BELMONTE (JEQUITIN-HONA).—The bar of the Rio Grande de Belmonte has between 6 and 7 feet over it at high water, it often changes; the shoals extend off upwards of a mile, it is at all times dangerous, and after the rain the current sets out very strong. A pilot is stationed at the entrance to direct vessels in entering, by waving a flag to starboard or port, and holding it upright when steering the proper course. The river should be approached on a N.W. by N. bearing. At 2½ or 3 miles north-east of the bar there is a depth only of 4½ and 5 fathoms water, whereas to the south-east the same depth will be found at 1½ miles. Anchorage will be found off the bar in 6½ or 7 fathoms water, with the village bearing about W. by S.

LIGHT.—On the south side of Rio Grande de Belmonte, stands a square white tower 43 feet high, from which, at an elevation of 59 feet, is exhibited a *fixed* white light, visible in clear weather from a distance of 10 miles.

Belmonte, with a population of about 800 inhabitants, stands on the south point of entrance to the Rio Grande de Belmonte, the most easterly point south of Bahia, but from the uniformity of the land and the town being surrounded by cocoa-nut trees, it is difficult to find from the offing. To the south of the entrance are some low hills, and breakers extend a mile from the bar. In the middle of the breakers, at the north point of entrance, is a small sandy islet visible 5 or 6 miles, and if coming from the southward the remarkable group of trees is a good guide. The river will be known by a small opening in the sand, and about 10 miles from its mouth the water is sometimes much discoloured by large reddish spots.

The COAST from the mouth of the Rio Grande de Belmonte trends in a southerly direction 36 miles to Porto Seguro. At 5 miles south of Belmonte the Rio Mugiquissaba, the principal of several small rivers on this part of the coast, disembogues in a small bay named Conchas, known by a group of isolated trees on the shore, resembling at a distance a large rock or islet. This part of the coast, although low, is higher than that to the northward. In the interior

lie some low hills, covered with trees, which rise gradually in height to the southward; when the weather is clear the two mountains Dos Irmaõs, in latitude 16° 11′ at about 20 miles inland, will be seen.

Off the remarkable group of trees in Conchas bay, which are conspicuous from the offing, there is a depth of 5 fathoms at the distance of 4 miles; this shallow water continues south, at a greater distance from the coast, for 7 miles, when the edge of the bank trends towards Araripe reef off San Antonio point, northward of Santa Cruz.

SAN ANTONIO POINT.—Araripe reef.—A line of coral reefs border the shore from San Antonio point to as far south as the parallel of the church of Santa Cruz, a distance of 9 miles. The northernmost reef, named Araripe, surrounds San Antonio point at the distance of 3½ miles, and is partly uncovered. From thence southward the reefs continue in detached patches along a low and uniform coast, with nothing to mark it, and which should not be approached nearer than 4 miles, in 14 fathoms water, as when the winds are light the sea does not always break on the outer reefs: they are steep-to, and the lead is the only guide.

There are passages between these reefs leading to San Antonio, Santa Cruz, and Cabral bays.

SANTA CRUZ BAY,* at the northern part of an indentation about 7 miles in length and 1¾ miles deep, is protected by the southern reefs of the line which borders the coast from the northward. Between these reefs and the shore of Santa Cruz, there is a clear space of about 2 miles, with 6 fathoms water, sandy bottom in the outer part, and 2½ fathoms in the inner. The coast of the bay about midway is of moderate height, with some woody hills, from 100 to 130 feet high, leaving between them a depression in the land, forming the bed of the river Juan de Tiba, and which is remarkable from the offing. On the high land over the north point of the river is a conspicuous tree.

The beach of sand which forms the shore of the bay is interrupted by two chains of rocks; one commencing at the foot of the town extends along the coast for 2 miles to the north, and forms, as it were, a quay along the right bank of the river; the second chain is midway between the former and the north point of the bay.

See Admiralty plan:—Cabral and Santa Cruz bays; scale, $m = 0{\cdot}7$ of an inch, on chart, No. 529.

Itassepanema reef lies N.E. and S.W., 2 miles in length, and 5 cables across; it is nearly all uncovered, with the Coroa Alta, a sandy islet, rising from the middle, and lies north-east of Santa Cruz bay, with its outer edge 1¾ miles from San Antonio point. Close westward is a small channel, having 10 to 13 feet, navigable for coasters. Between its south end and Alagadas reef is the Boqueraõ Grande channel, three-quarters of a mile wide and 6½ fathoms deep.

The Alagadas are two reefs, each about 5 cables in length, with the Boqueraõ Pequeno channel between them, about 3 cables in breadth with depth of 8 fathoms. The northern Alagadas is 7 cables S.W. by S. of Itassepanema reef. They are steep-to, and do not always break. The south extreme of the Alagadas lies E. ¼ S. from the church of Santa Cruz, and is the north boundary of the passage to the bay.

Cabral bay, situated about 4 miles southward of Santa Cruz bay, in the same indentation, has in its centre a depth of 4½ fathoms; a stream of good water falls into it. Cabral bay is celebrated in history as the landing place of Pedro Alvarez Cabral, two days after he discovered Brazil by sighting mount Pascal and the coast of the Rio do Frade, on the 24th April 1500. From Vermelha point, the south extreme of the bay, a reef which uncovers at low tide extends about three-quarters of a mile to the northward, forming to the westward a little port sheltered from southerly winds. Close to the point is an islet of red sand.

Vermelha bank, about 50 yards in extent, with 10 to 13 feet over it at low water, and on which the sea rarely breaks, lies about 1½ miles from the point of the same name, about 6 cables N.E. by N. of the extreme of Vermelha point reef, and S.W. distant 2⅔ miles from the Alagadas south reef. This shoal forms the southern limit of the principal passage to the bay, and bears S.E. by S. from the church of Santa Cruz. In the channel between it and Vermelha point reef, there is a depth of 6 fathoms water, and 6 to 7½ fathoms all round it.

Buoy.—A buoy with staff and flag, marks the northern edge of Vermelha bank.

Ina rock.—About half a mile southward of Vermelha point is Ina point. At about 1½ miles from the shore, and the same distance

S.E. by E. ½ E. from Vermelha point, is a detached rock named Ina, with about 10 feet water, on which the sea rarely breaks. There is a depth of 9 fathoms between it and the shore.

Anchorages.—The best berth in Santa Cruz bay is with the point of the reef at the entrance to the river, in line with the conspicuous tree on the hill, bearing W.N.W. distant half a mile, in about 4 fathoms, muddy bottom and good holding ground. A good berth in Cabral bay will be with the north extreme of Vermelha point reef about S. ½ E. distant one mile, in 5 fathoms, fine muddy sand, or, if convenient, a little farther in. Vessels should anchor in Santa Cruz bay with the wind from north to east, though the sea is never heavy even with south-east winds, but with the latter winds, Cabral bay should be used.

Tides.—It is high water, full and change, in Santa Cruz bay at 3h. 40m.

Directions.—When bound to Santa Cruz from the northward, a vessel's position can be verified by the Serra Commandatuba; and when from the southward by mount Pascal and the high red cliffs of Porto Seguro; if from the offing, the land should be made according to the prevailing winds. If low woody land be first seen, the vessel will be to the north of Santa Cruz; but if hills of moderate height and red cliffs, to the south-westward, she will be to the southward and in sight of Porto Seguro. On sighting the land near the parallel of Santa Cruz, and at 15 to 18 miles distant, a break in the coast will be seen indicating the entrance to Santa Cruz river; the two green slopes of the hills contrast with the red roofs of the church and village.

On the northern hill will be seen the large isolated tree, and in clear weather the two hills, Dos Irmãos, rising 18 or 20 miles W.N.W. of the port. When at a distance of 5 or 6 miles from the church, bring it to bear W.N.W., and steer for it, which will lead in midway between the Alagadas reefs on the north, and Vermelha bank on the south. When the water shoals to 7 fathoms, and the vessel is within 2 miles of the shore, she may haul up for the anchorage off the mouth of the river, or steer to the south for that of Cabral bay.

In working into the bay, a vessel should not stand farther north towards the Alagadas, than to bring the church of Santa Cruz to bear W. ½ N., nor to the south towards the Vermelha, than to bring the church to bear N.W. ½ W. Under favourable circumstances, and

if the buoy of the Vermelha bank is in its place, a vessel may pass between it and the extremity of the Coroa Vermelha.

River Santa Cruz or Juan de Tiba rises in the chain of the Aymores, and falls into the sea in Santa Cruz bay. It is navigable from its mouth to within 30 miles of its source. The rocks which extend from the foot of the village of Santa Cruz to the northward, parallel to the shore, form a natural barrier, and may be considered a continuation of the river's right bank to the entrance. Here, at 2 miles from the village, the river falls into the bay by a channel about 110 yards wide and 14 feet deep at high water, with 8 to 10 feet nearer the village.

Small vessels can make good repairs here, although a chop of a sea is sometimes felt when the wind and tide are contrary, but the swell from the offing is broken by the outer reefs. The line of rocks is broken in the middle, affording access for boats. The left bank, at the entrance of the river, is a low shore covered with mangrove trees, and at 100 yards inland are some pools and a rivulet of soft water descending from the neighbouring hills.

Village.—The village of Santa Cruz is situated on the site where, in the year 1500, Cabral fixed the cross, as a sign of his having taken possession of the continent, which he had discovered, in the name of the king of Portugal. He named it Santa Cruz, and it was about the middle of the sixteenth century that this name was changed for that of Brazil; but the village preserved its original name, and the bay that of the navigator.

The village of Santa Cruz was founded in 1536 by Pedro de Tourinho; it has been destroyed many times by the Aymores Indians, and has never acquired any importance, notwithstanding the convenience of the bays. It stands partly on the summit of a hill about 130 feet above the level of the sea, and partly on the low coast, in the middle of some groups of cocoa-nut trees; the red roof of the houses and church are seen from several miles seaward. Trade is very limited, merely the exportation of a little wood and fruit.

Aspect.—From the low point of Vermelha, the shore trends to the south for about half a mile to Ina point, and at one mile farther on to the equally low point of Muta or Punta Grande, thence in a south-westerly direction to Porto Seguro, which is 9 miles southward of Santa Cruz. In this space two small rivers run into the sea: the Rio Manguinha a little west of Muta point, and the San Francisco at one mile north of Porto Seguro.

At a mile within Muta point, to the middle of the small red cliffs visible from the offing, a chain of hills rises parallel to the shore, which increase in height to the southward, presenting some small red cliffs with groups of cocoa-nut trees. This chain of hills terminates abruptly at Porto Seguro, where the land trends to the west and forms a marshy valley, bounded at 2 miles to the south by coast similar to that northward.

This valley is apparent from the offing, and is the bed of the Rio Buranhen, near the mouth of which is the town of Porto Seguro. At 5 or 6 miles south of the town are the high red cliffs known as the Barreiras de Porto Seguro, and visible from 25 to 30 miles; they form with the above valley and mount Pascal, marks which cannot be mistaken. Porto Seguro may also be known by the church of Nossa Senhora da Peña or Matriz, situated on the height to the north of the town; it is white, and conspicuous when the sun shines on it, especially in the morning.

The Malembar, a large isolated tree, stands on the crest of the coast at one mile north of the church, and is clearly defined. There is also another church on the hill south of the valley, named Nossa Senhora da Judea, which is rather less conspicuous than that of Porto Seguro; it is visible when bearing S.W. or West, but is masked by the trees in coming from the southward.

PORTO SEGURO REEFS.—From Cabral bay the low shore southward to Porto Seguro is skirted by extensive reefs. Porto Seguro reef lies between the place of the same name and Muta point at 4½ miles north of it, with its outer edge upwards of 4 miles from the coast, some parts of which uncover or break continually. The outer part of the reef is named Baixo da Fora; the south-west part, near the port, consisting of some detached patches, Sororoca; and the south part of the same reef, which breaks, Itassepanema. There is a narrow winding channel carrying 3 fathoms water, between the outer and the coast reefs, at the distance from a half to three-quarters of a mile from the shore, leading to Porto Seguro. It is only practicable for small steamboats with very good pilots.

The north edge of the outer reef is a little southward of the parallel of Muta point. The church of Santa Cruz bearing N. by W. ½ W. leads close to its north-east edge, which is a little outside the line of that town and Vermelha point reef; the southern edge is near the parallel of Malembar tree; and the south-east edge is in line with mount Pascal and the north end of the red cliffs of Porto Seguro.

Clearing mark.—When the weather is clear the best mark for passing eastward of the reef, is mount Pascal open south of the red cliffs of Porto Seguro, which leads 2 miles to the eastward. At night they should not be approached nearer than 3 miles, or to a less depth than 15 fathoms. There is a depth of 7 or 8 fathoms, sand and coral, close to these dangers.

PORTO SEGURO, at the entrance to the Rio Buranhen (ancient Cachoeira), is fronted by a ledge of rocks parallel to the shore for the distance of about half a mile, and forms, at the north end of it, a channel into the river about 110 yards in breadth, 14 feet deep at high water, and 6 feet at low water. At one mile above the town there is about 12 feet at high water. The left bank is a broad sandy beach, at the end of which is the town at the foot of the hills.

The town, which owes its name to the shelter the anchorage is supposed to have given during twenty-four hours to the vessels of Alvarez Cabral, was founded in 1534, for felling and collecting Brazil wood. It is formed of three adjoining villages; Pontinha, Marcos, and Pacata, and stands on the sandy banks of the river, but chiefly behind the elevated land north of it, containing about 400 houses and 3,000 inhabitants.

A large number of fishing vessels belonging to the port are employed in the vicinity of the Abrolhos isles; they keep the sea for a month or six weeks, until their cargoes are completed. The principal fish is of the salmon species, which is salted for the Bahia market.

Anchorage.—The anchorage is well sheltered with the winds from north to east, by the reefs which trend northward, and nearly join those of Porto Seguro; but it is open to the south and south-east, and in strong winds exposed to a heavy sea from that quarter. A vessel would be in danger if surprised by a gale from this latter direction, and should be prepared to leave should the wind freshen. But very bad weather on this coast is rare, and during the worst season, that of June, July, and August, there is little to fear but the squalls from the S.W., which are of short duration, and seldom sufficiently strong to be dangerous when the seaman is on his guard.

Directions.—Vessels bound to Porto Seguro from the northward, should steer along the coast at a distance of 8 or 10 miles, in 16 to 20 fathoms; the Serra de Commandatuba and the red-roofed

houses of Santa Cruz will be seen, and, in advancing to the southward, the white church of Porto Seguro at a distance of 15 miles; soon after, if the weather be clear, mount Pascal will appear in the horizon like an isolated round hill, and in the same direction the red cliffs of Porto Seguro.

When these latter objects are seen, mount Pascal should be brought open south of the cliffs, and well open if the wind and swell are towards the shore. When the church of Porto Seguro bears northward of W. by N. ½ N., steer for it to the anchorage at half a mile eastward of the extremity of the rocks, which form the entrance to the port, with the church bearing N.W. by W. ½ W., and the red cliffs of Porto Seguro S.S.W. ½ W. in 5½ to 6½ fathoms, sand and mud, good holding ground.

If from the offing without having made the land either north or south, steer on about the parallel of 16° 25′, and when at about 30 miles from the coast, the land will appear broken by the deep valley of the Rio Buranhen, and on nearing it, the landmarks previously described will be seen, when a vessel can proceed as before. If from the south or south-east, mount Pascal and the red cliffs will leave no doubt as to the vessel's position.

The COAST from Porto Seguro trends in a southerly direction for 19½ miles to Joacema or Insuacome, a white cliffy point. At nearly 3 miles southward of Porto Seguro church is that of Nossa Senhora da Judea, which is conspicuous, and forms a good mark; a little northward commences a series of hills, occasionally wooded, and at 1½ miles southward is the commencement of the Barreiras de Porto Seguro, steep red cliffs 130 to 165 feet high, and which are visible some distance seaward; they extend to the southward for 3 miles, where they are broken by the Rio Trancoso.

At 7 miles farther on is the Barra do Frade, and about 4½ miles beyond is Joacema point. In this latter space the coast is broken and uneven, presenting alternately wooded ravines and small white cliffs, which become more white as the point is approached.

Rio Trancoso and **Rio Frade.**—The Rio Trancoso runs into the sea in lat. 16° 34′ through a valley about 1½ miles in breadth, separating the northern from the southern portion of the red cliffs. A village of the same name (chief of a district containing 1,500 inhabitants), is situated on the hill on the south side of the valley, surrounded by cocoa-nut trees, and visible from the offing.

At the commencement of the Barreiras, Pitanga rivulet runs into the sea.

To the south of the Trancoso are some red cliffs about 2 miles in extent, whence the coast becomes lower forming a valley, through which, along the hills to the southward, the Rio Frade runs into the sea at 7 miles from the Trancoso. Rio Frade is navigable only for boats, and its bar is dangerous. Itaquena point, at 2½ miles north of the entrance, is low and wooded, with a few houses on it; a stream discharges at the point. The aspect of the coast is pleasing and picturesque. The south point of entrance is bold, and projects a mile seaward.

JOACEMA (INSUACOME) POINT,* situated 4 miles south of Rio Frade entrance, may be known by two or three white scarped cliffs, which form as it were steps to the south, and are the first of the kind in coming from the north, mount Pascal bearing about W.S.W. (distant 20 miles south-westward from the point), is also a good mark. The coast north of the point may be approached to the distance of a mile in 9 to 11 fathoms water.

The low broken point of Carunba, lies South, distant 7 miles from that of Joacema; the shore between forming a bay about 2 miles deep. In the southern part of the bay the Rio Carunba enters the sea, and there are some houses south-east of it. The point is surrounded by Itacolomis reefs.

It is high water, full and change, in the vicinity of Joacema point at 3h. 30m.

Joacema and Pitiassu reefs.—The Joacema reef, about a cable in diameter, has about 3 feet over it at low water, is composed of sand and coral, and lies half a mile south of the point with 10 feet water in the channel between; there is a depth of 12 feet between the bank and coast, 21 feet in the channel it forms with the Pitiassu, at about three-quarters of a mile south of it, and nearly 4 fathoms at 2 cables eastward of it.

The Pitiassu reef is larger than Joacema, being half a mile in diameter, with about 2 feet at low water; it lies 2 miles southward of the point, and 1¼ miles E.S.E. of Juricuara point. Between it and the coast there is a depth of 3½ to 4¼ fathoms, sand, and mud: and in all other directions, at the distance of a cable, 5 or 5½ fathoms.

* *See* Admiralty chart :—Abrolhos rocks, with the adjacent coast from San Mateo to Itacolomis reef, No. 904; scale, $m = 0{\cdot}3$ of an inch.

Anchorage.—Within these reefs the shore is clear of danger, and there is good anchorage for small vessels, and better than that of Porto Seguro; it is well sheltered from all winds, and protected against the swell from the South and S.E. by the Itacolomis reefs, and from the East and N.E. by the Joacema and Pitiassu reefs and coast. The access is easy, so also is communication with the shore; landing may be made in the creek inside the point, or in the river, at favourable times of the tide. On the shore west of the point at about a hundred paces from the sea, is a small lake of soft water.

The coast from Joacema point southward, is formed of small hills of less height than the land to the northward; and at the distance of 3 miles is the mouth of the Rio Cramimuan, with Juricuara point, remarkable by its red colour, between. From the Cramimuan the shore is low, woody, and trends to south-south-eastward for 5 miles to Carunba point; in this part of the bay, sheltered from the east by the north part of the Itacolomis, are several reefs.

Rio Cramimuan.—The entrance to this river, 6 feet deep at high water, is 3 miles southward of Joacema point, and is known by the hills north of it, Juricuara point, and by some large groups of cocoa-nut trees sheltering the village of Cramimuan at a mile from the shore, on the right bank of the river.

Directions.—In fine weather a vessel will find temporary anchorage in about 5 or 5½ fathoms water, mud and good holding ground, at three-quarters of a mile S.E. of Joacema point, and about the same distance eastward of Joacema reef; but in a fresh breeze a vessel should anchor inside the Pitiassu, or between it and the coast, passing in either north or south of the reef. When the tide is low, the breakers indicate sufficiently the position of the rocks, but at high water with a smooth sea the following route should be taken:—

Bring Joacema point to bear about N.W. by W., and when at a distance of 2 miles from it, the isolated red cliffs of Juricuara point will bear about West, and the entrance to the river Cramimuan, remarkable by the groups of cocoa-nut at the commencement of the low land, W.S.W.; then steer for Juricuara point, in mid-channel, between the Pitiassu and the Joacema reef north of it, and anchor in 4½ to 5 fathoms, mud, at about half a mile from the shore, with the point N.N.W. or N.W. by N., distant one mile.

In proceeding south of Pitiassu reef, steer on the parallel of the bar of the Cramimuan, and anchor as before.

MOUNT PASCAL, a remarkable peak, 1,758 feet high, forms part of a group of hills lying nearly in a north and south direction, and so named from its being the day of Pascal when Pedro Alvarez Cabral first saw it in the year 1500, when he discovered Brazil. The mount rises about 19 miles inland, nearly in the parallel of Corumbao point, and about midway between Porto Seguro and Prado.

When seen from the north-east or eastward, it is like an isolated round hill, slightly conical, and higher than the surrounding land; but from the south-east it appears connected by many other hills, less elevated, and one remarkable peak in the form of a large cylinder or tower on the summit of the mountain. This is Juan de Leâo peak, which rises nearly 12 miles S.W. by W. ½ W. of Mount Pascal, and appears a little higher than that mountain. These are the only summits in sight from the offing, that are seen between the Serras de Commandatuba and the high land of Espirito Santo. Mount Pascal may be seen at a great distance, and from its height and isolation is a most useful land mark for this part of the coast.

ITACOLOMIS REEF, is a cluster of rocks, several of which are uncovered at low water, rising from a sand-bank which extends north and south for a distance of 7 miles, with its southern edge 5 miles to the south-east of Carunba point. In the middle of the bank the numerous patches of coral are much broken, and uncover at low water; but towards the edge it is less broken, becomes covered, and the water deepens from the centre. The reef is steep-to, rising perpendicular from a uniform bottom of 8 to 12 fathoms deep, and about the same depth is found at 3 miles from it; the soundings within this distance will not therefore indicate an approach to these dangers. The centre of the reef is on the parallel of mount Pascal; the north end lies with the mount bearing W. ½ S., and the south end with the mount W. by N. ½ N.

There is a depth of 12 fathoms water about three-quarters of a mile from the outer edge of the bank, and the same depth will be found about 5 miles south-east of it. About the middle of the edge there are 5 and 8 fathoms close-to. By not going into a less depth than 17 fathoms, a vessel will be more than 3 miles from the reef, and during night it will be prudent not to go nearer than 20 or 22 fathoms water.

ITACOLOMIS CHANNEL and CARUNBA POINT.—Carunba point is bare, very low, covered for several cables at high water, and forms the delta of several small rivers. It is situated

within the middle of the reef, and separated from its western edge by a channel about 110 yards wide, with 2¾ to 5 fathoms; but it is tortuous, unfit for general navigation, and only practicable for small steam vessels having good pilots. The most favourable time for using the channel is at low water, when the reefs are uncovered. Small steam vessels bound to the northward with a strong breeze find smooth water in this channel.

From Carunba point the shore trends to the south-westward, and with the edge of the reef forms a tolerably large angular space, where there is anchorage in about 5 fathoms, sand and mud, good holding ground, and sheltered from all winds except the south.

The COAST from Carunba point trends a little westward and then south to Prado and Alcobaça. In the first part between Carunba point and Comoxatiba, a distance of 14 miles, the coast is formed alternately of sandy beaches and four cliffs at about equal distances. The Barreiras de Cahy, at 7 miles southward of Carunba point, are large, white, remarkable cliffs, and serve as a mark, conjointly with a large tree showing above the woody coast, for the Itacolomis channel.

The tree known by the name of Maruhim stands near the shore midway between Carunba and Matto Grosso point, at 2 miles southward of the former. At about 3 miles southward of Barreiras de Cahy is the Barreira de Tahua, a low reddish cliff. The Barreiras d'Imbossuaba are also red cliffs, in lat. about 17° 4′, in a small bay; they are visible from the south-east. Streams of no importance run into the sea between the different cliffs.

Patachos reef.—A chain of detached reefs extend along this coast at a distance of 2 or 3 miles, nearly on the meridian of Carunba point, with anchorage inside them for moderate sized vessels. The two southern of these reefs are named Patachos, and uncover at low water. At one mile northward of Patachos reef, is Tahua reef, between which and Carunba point are several isolated patches. At high water these reefs are covered, and the coast should not be approached in a less depth than 8 fathoms.

PORT COMOXATIBA.—A chain of reefs bordering the coast southward of the Patachos, forms at Comoxatiba a small basin, half a mile in extent, and 16 to 20 feet deep, and where a dozen coasters may find good shelter and smooth water even with a fresh breeze from the north-east. When the water is high, it passes over the reefs causing a little swell. A pleasant sandy beach, through which some

rivulets run into the sea, forms the head of the port and a hamlet and some cocoa-nut trees stand on the south end of the beach. On the highest hill, in the midst of thick vegetation, are the ruins of the ancient village and church of Columbiana.

Outside the port, along the reef, are depths of 5½ fathoms, sand and mud, increasing to 11 fathoms, mud, at 4 miles; but farther off at a distance of 17 to 24 miles nearly on the same parallel, are depths of 10 and 13 fathoms, over sand, sand and gravel, or madrepores and broken shells.

Comoxatiba point is easily known from the offing, as it is situated 3 miles northward of the extremity of the red cliffs of Prado. This point is covered with vegetation, which masks the hamlet near the shore.

A fishing village composed of about a dozen houses, named Dos Irmãos, stands in a ravine near the commencement of Prado cliffs, and is approached through a break in the recife.

Tides.—It is high water, full and change, in port Comoxatiba at 3h. 30m.; and the rise is from 5 to 6 feet.

BARERAS do PRADO.—The coast from Comoxatiba point trends a little westerly, and then nearly south, presenting a series of very remarkable uninterrupted red cliffs from 200 to 270 feet high, and 9 miles in length. These cliffs begin near the hamlet of Dos Irmaõs and extend southward to within 2½ miles of the village of Prado, from which they take their name, and being visible some distance they are the best mark for vessels navigating near the coast.

An uninterrupted chain of rocks, about half a mile from the shore, extend along these cliffs from Comoxatiba to their southern extremity, where they terminate in front of the south point of the cliffs in a large patch of coral, named Calçoes Fora, in lat. 17° 17′. At 3 miles from the Bareras do Prado there are depths of 6 to 8 fathoms, sand and mud.

No trace of habitation is seen along these cliffs; and the only remarkable break is that where the river Japara runs in the sea, at about 3 miles from their northern end. This is the last elevated coast land seen coming from the north, for a considerable distance, as from here to Espirito Santo, an extent of about 180 miles, the coast is nothing more than a low beach with here and there some scanty vegetation, and visible from 8 to 12 miles.

In front of this low land the bottom rises suddenly, and forms a vast plateau of about 150 miles in length and 120 in breadth, which is the base of the Abrolhos islets and reefs. This plateau, a species of granite, with irregular depths, rises abruptly like a wall from the depth of the ocean.

PRADO.—This town contains about 1,000 inhabitants, and stands one mile north of the mouth of the Rio Jucurussu, on a tongue of land formed by the river, running parallel with the coast for about that distance. The surrounding country is fertile, and produces large quantities of manioc; besides which the town exports wood and salt fish (groupas taken in the neighbourhood of the Abrolhos isles), but few other supplies can be procured.

The bar of the Jucurussu is dangerous even in fine weather. In the river at 6 miles from the town the depths are from 6 to 13 feet; and it is navigable for boats to 18 miles from the sea, where it divides into two small branches, named the Rio do Norte and the Rio do Sul.

Prado, Guaratibas, and Timbebas reefs.—At 3½ miles E.S.E. from the town of Prado is the north end of a dangerous reef, 110 yards in extent, of the same name, and which uncovers. There is a depth of 6 fathoms, sand and mud, at about half a mile outside it, and 2¼ fathoms at a mile northward.

At 3 miles S. by E. ½ E. of Prado reef is Guaratibas reef, with 5½ fathoms between, which also uncovers, with its outer edge 3½ miles E.N.E. from the point of the same name. It is a mile long north and south, a cable in breadth, and separated into two parts by a narrow channel having 4¼ fathoms water. A sand-bank stretches to the westward for 2 miles, thence south for 3 miles, with a depth of 1½ to 2½ fathoms; there is a passage for coasters inside it.

At 7 miles S.E. by E. ½ E. from the northern part of Guaratibas reef, and 10 miles from the shore, is the north-west end of Timbebas reef, with 8 and 10 fathoms water between them. From thence the reef extends to the south-east for 3 miles, with its outer edge 12 miles from the shore, and 9 fathoms water a mile outside it. It is somewhat circular, and from 2½ to 3 miles in diameter. In the centre the coral uncovers. Timbebas reef, being so far off the coast, is the most dangerous of the group, as, when at one or 2 miles from it, the land appears as a uniform line with nothing to mark it. The centre of the reef is 12 miles E. by N. ¼ N. from the village of

Alcobaça, 13 miles S.E. by E. from Jucurussu bar, and S.S.E. ½ E. from mount Pascal.

The lead is of little use in approaching this bank, as the depths are nearly the same within the limits of 2 and 8 miles from it. There are however, some patches of coral, with 5½ and 6½ fathoms water on them, at 4 miles distant. When the winds are fresh from the offing the current sets strong to west or south-west.

Directions.—Vessels bound to Prado from the east or north-east should avoid Timbebas reef, by making the Bareras do Prado in about latitude 17° 15′, and if the weather is clear mount Pascal will be seen at a distance of 45 miles, at 30 miles from the coast, where the depth is from 17 to 22 fathoms, coral bottom. The cliffs will be seen to rise gradually at a distance of 15 miles; a little after the coast to the southward appears as a line of trees, the first group seen will be the large trees on the south side of the entrance to the Rio Jucurussu. When near, this group appears but little higher than the others, but seen from a distance, is more marked.

When the village and white church of Prado are seen, steer so as to pass north or south of Prado reef (the northward is preferable), and anchor in about 4 fathoms, sand and mud, at one mile from the bar, with the village to the north-west distant 2 miles. This anchorage is partly sheltered from the sea by Prado and Guaratibas reefs. The flood tide sets to the southward, and the ebb to the northward. The currents in the offing depend much on the direction and force of the winds.

The COAST, from the town of Prado, trends to the southward for about 4½ miles, to the low point of Guaratibas, then for 8 miles farther to the bar of Alcobaça, where it trends to the south-east for 8½ miles to Baleine point. On all this extent it has the same aspect, and is visible at a distance of about 12 miles; the low beach is crowned with a line of uniform vegetation, and some trees a little higher than others, serve as marks; of which the three following are the most conspicuous:—

The large group of trees at Prado appears above the horizon at 13 or 14 miles distant, but their height appears to diminish as the coast is approached; they are of great utility when navigating near Timbebas reef. The Fincudo, is a large round tree, rising above those in its vicinity, and very remarkable; it is near the shore, at 2 miles south of the bar of Alcobaça, for which place it serves as a mark, and is seen first in the horizon above the low coast.

The tree of Caravellas, on the most elevated land near the shore 3½ miles south-west of Baleine point, serves to guide vessels when outside Caravellas bank; it is of great use to the fishermen.

Alcobaça.—The little village of Alcobaça stands between the shore and the left bank of the Rio Itanhem, which runs into the sea at 2 miles southward of the village. When seen from the offing it appears larger than Prado, but it contains only between 700 and 800 inhabitants, the greater part Indians. There is less commerce here than at Prado, although the river is easier of access, and can be entered during fine weather and favourable tide by coasters of 6 feet draught. Pilots are always to be obtained.

The Rio Itanhem runs from the chain of the Aymores, and is navigable for some miles. At one mile eastward of Alcobaça there is a depth of 5½ fathoms, sand and mud; and at 5 miles 7 and 8 fathoms, mud. At about a mile to the N.N.E. of the village is a small patch of rocks, but its exact position is doubtful. From the bar of Alcobaça the coast, forming a bay to the southward is bordered, by an extensive sand-bank, with 1½ fathoms at 4 miles from the shore. At 3 miles southward of Fincudo tree is the Barra Velha, a little river, with a fishing village.

Baleine point is low, woody, the most salient on all this part of the coast, and forms the north point of entrance to the Rio das Caravellas. On its extremity are two houses with red roofs, and a mast rising from the midst of the verdure, visible from the offing. An extensive sand-bank fronts the point for the distance of 4 miles, partly dry at low water, leaving between it and the shore, the northern channel to Caravellas carrying 14 feet at high water.

PARCEL das PAREDES are extensive banks and reefs lying off Baleine point, and north-westward of the Abrolhos islets, bordering the coast for a distance of 25 miles; large portions of the reefs are awash or above water, and it is so steep-to as to have acquired the name of Paredes or walls. The northern part of the outer edge of the main group is distant 11 miles E. ½ S. from Baleine point, and its southern point is 18 miles from the shore, extending over a space, north and south, of 14 miles. Isolated reefs extend in a N.W. by N. direction for 6½ miles from Lixa reef, the north-west point of the main group, terminating in Arca reef, which dries in sandy patches at low water. Between Lixa and Aranguera reefs is the Boquerea channel; between Aranguera and Cabocolas reefs is

the Tainhas channel, in which are several isolated patches; and northward of Arca reef is Itanhem channel.

Sebastiaõ Gomez and Coroa Vermelha reefs.—At 7 miles westward of the south edge of the main group is the north-east reef of the southern cluster, named Sebastiaõ Gomez, about one mile in extent, which uncovers at low tide, and at about 5 miles N.N.E. ½ E. of which are two isolated patches. The channel between carries from 5 to 11 fathoms water. At 5½ miles S.W. by W. of Sebastiaõ Gomez is the Coroa Vermelha, an islet of reddish sand, 3 feet above water, and about a third of a mile in diameter. The islet has some small trees or brushwood on it, and is seen 6 or 7 miles. A reef of coral extends 2 miles north of the islet, and uncovers. There is a passage between this reef and that of Sebastiaõ having from 6 to 9 fathoms water.

The depths are reported to have decreased considerably between Coroa Vermelha and the 2¼-fathoms patch westward of it.

Viçosa reef.—At 3 miles south-westward from the islet, and 7 miles from the mouth of the Rio Perohipe is the south-west part of the group, named the Viçosa reef, which uncovers at low water, and is about 4 miles in length in a north-west and south-east direction. At 14 miles E. by S. ¾ S. from the Coroa Vermelha, 16 miles W. ½ S. from the Abrolhos lighthouse, and on the meridian of the centre of the main group of the Paredes, lies a shoal on which the sea breaks, named Poppa Verde, with 2¾ fathoms. Within and between the reefs there are navigable channels for small coasters.

Itanhem and S.E. channels.—Directions.—Between Arca and Timbelas reefs, a distance of 7 miles, is the Itanhem channel, with depths of 7½ to 12 fathoms. The bottom consists of mud, and extends from 8 to 10 miles eastward, serving to indicate the approach to this channel on the parallel of Alcobaça. This channel, much used by coasting craft, leads to the passage between Parcel das Paredes and the sand-banks off Caravellas, thence to the southward, by the S.E. channel, or the passage between the southern reefs and the shore. Westward of the Paredes, the water shoals gradually towards the sand-banks off Caravellas, and vessels may safely navigate the channel in 5½ and 6½ fathoms until abreast the conspicuous cocoa-nut trees of Felix, southward of Caravellas, when the position may be ascertained by bearings, and the course directed accordingly. In the northern portion of the channel, depths of 8 and 9 fathoms indicate

the approach to the steep edge of the Paredes. The S.E. channel is the best route to Caravellas from the southward.

The ABROLHOS,* or islets of Santa Barbara, distant 30 miles S.E. ⅓ E. from Baleine point, are five in number, exclusive of rocks, the whole occupying a space of about 1¼ miles. Santa Barbara, the largest islet (about 130 feet high), is three quarters of a mile in length, east and west, by 200 yards in breadth, with a lighthouse near the eastern extremity. The other islets are Redonda, Siriba, South-East, and Guarita. The only vegetation on them are rushes, cactus, and wild purslain. Innumerable birds dwell on these islets, and cover them with their nests and eggs. Turtle at times have been found.

Sea salt crystallized is found in several places, and a small quantity of fresh water filters through the rocks at the north point of Santa Barbara islet. This islet is free from danger, with the exception of the west end, where a reef extends to the north-west for a distance of about 1½ cables. The three smaller islets to the south-westward are each bordered with reefs, which extend off about 1½ cables. The two westernmost islets are connected by a reef; and there is a narrow channel having 2¼ fathoms water between them and Santa Barbara.

At the distance of 6½ cables eastward of the south islet is the western edge of a bank, 3 cables in breadth, having only 20 feet water over it, and about 2 cables northward of this bank are several patches of 19 feet. With these exceptions the water between the islets is deep, and a vessel may if necessary pass at a distance of a third of a mile on either side, or between them. About one mile eastward of the islets are shallow patches on the edge of Parcel das Abrolhos.

PARCEL das ABROLHOS is a coral bank, with an average depth of about 10 fathoms, with shoal spots of 3 to 10 feet, and rocks which uncover towards the centre. It is 9 miles in length in a north and south direction, and 2 miles in breadth, with its eastern edge 4 miles from the lighthouse. A vessel having the sun astern may cross the bank guided entirely by the eye in avoiding the coral patches, but in calm weather or with the sun ahead, these shoals cannot be discerned in time to clear them. At about a mile from the south-west edge of the bank is a shoal spot with 5½ fathoms water on

* *See* Admiralty plan:—Abrolhos rocks anchorages, on chart No. 904; scale, m = 2·75 inches.

it. Between this shoal and the bank there are depths of 14 fathoms, and at 2 miles from the eastern edge of the bank, or 6 miles eastward of the meridian of the lighthouse, there are from 12 to 18 fathoms water. Vessels are recommended to give the bank a good berth, as it is steep-to.

In the vicinity of these rocks, fishing is carried on by the inhabitants of the neighbouring coast. Those of Porto Seguro send about 50 vessels every year during the northern monsoon; they take cargoes of fish (groupas), which when dried form the ordinary food of the people. The vessels generally remain out six weeks.

LIGHT.*—On the eastern part of Santa Barbara is an iron circular tower 50 feet high, which exhibits at the height of 189 feet above high water, a *revolving* white light, which attains its greatest brilliancy *every minute*, and should be seen in clear weather from a distance of 20 miles. Within 7 miles a faint continuous light is seen; westward of the light a small sector is obscured by Redonda islet when within 3 miles. Reported irregular, 1891.

Anchorage.—There is anchorage with northerly winds in 9 fathoms, sand and shells, about midway between Santa Barbara and S.E. islets, with the lighthouse bearing N.E. ½ E. distant half a mile; and with southerly winds, to the northward of Santa Barbara in 8 fathoms, fine sand and shells, with the lighthouse S.E. by S. distant rather more than half a mile, and about a quarter of a mile from the shore. A vessel may pass on either side of South-east islet and eastward of Santa Barbara at the distance of a quarter of a mile, in from 8 to 10 fathoms water.

Tides.—It is high water, full and change, at the Abrolhos rocks, at about 3h. 20m.; and the rise is from 6½ to 7 feet. The tides are tolerably regular, but influenced by the strength and direction of the wind. The current runs from one to 1½ miles an hour; in the narrow channels of the Paredes it attains 3 miles an hour and follows the direction of the channels, though much influenced by the force and direction of the winds.

ABROLHOS CHANNEL is bounded on the east by the rocks and bank of the same name, and on the west by the extensive banks and reefs of the Parcel das Paredes. The channel is 10 miles wide, and may be taken in clear weather, for, with the exception of

* Light reported uncertain, January 1885, and August 1891.

Banco Marajo and La France shoals, and two spots having 6 and 7 fathoms, the general depths are from 9 to 13 fathoms. As the banks are, however, steep-to, little or no dependence can be placed on the lead, yet, as a rule the depth of water rather increases on approaching the reefs, when a white chalky mud will be found.

Shoals.—Banco Marajo shoal, composed of coral, and having a depth of 2 fathoms at low water, of irregular shape, and about one square mile in extent, lies with Abrolhos rocks lighthouse bearing South, distant 13 miles.

Two shoals, composed of coral, and having each a depth of 6 fathoms at low water, lie with Abrolhos rocks lighthouse bearing South, distant 10½ miles, and S. by E. ¼ E., distant 4 miles respectively.

A shoal, composed of coral, and having a depth of one fathom at low water, lies with Abrolhos rocks lighthouse bearing S.S.W. ¾ W., distant 1$\frac{4}{10}$ miles nearly.

Two shoals, composed of coral, and having each a depth of 2½ fathoms at low water, lie with Abrolhos rocks lighthouse bearing S. by W. ¾ W., distant 1¼ miles, and S. by W. ¼ W., distant three-quarters of a mile respectively.

La France shoal, on which *La France* touched, is stated to lie with Abrolhos lighthouse bearing S. ⅛ E. distant 6 miles. The positions assigned to these shoals are approximate.

California shoal on which the British ship *California* is reported to have struck (1891), has on it a depth of 4 fathoms, and is said to lie with Abrolhos rocks lighthouse bearing N.N.W. ½ W., distant 11¾ miles.

Directions.—Intending to pass through the Abrolhos channel from the northward, the islets should not be approached nearer than 13 miles without ascertaining the vessel's position. But with the light in sight about 15 miles distant, bring it to bear S. by E. and steer for it, which course will lead (probably) about 2 miles westward of Banco Marajo shoal. When at the distance of about 9 miles from the light, steer S. by W. in 10 to 12 fathoms water, which will lead about 2 miles westward of La France shoal, and about 4 miles westward of the light, and clear of all dangers.

From the southward, keep the light on a N.E. bearing, and when at the distance of 6 or 7 miles from it, steer North, which will lead

about 4 miles westward of Abrolhos lighthouse, and through the Abrolhos channel clear of all known dangers.

Caution.—As there are banks of 6 fathoms, named Calladas shoals, north-north-eastward 16 to 23 miles distant from Abrolhos lighthouse: caution should be exercised when navigating in their vicinity, as less water may exist.

OUTLYING BANKS.—There are several outlying banks off this part of the coast of Brazil. The south end of the northernmost (H.M.S. *Fly*, 1823) is on the parallel of 16° 53′ S. and in longitude 36° 13′ W., from thence it extends to the northward for about 6 miles, having a breadth of about 2 miles, with 31 and 32 fathoms water over it. The assigned position of this bank was crossed by H.M.S. *Sylvia* in 1882, but no bottom was obtained with 65 fathoms of line.

Rodgers bank, having a general depth of 30 fathoms, was discovered by Commander F. Rodgers, of the U.S.S. *Adams*, in 1877. This bank is 15 miles long in an E.N.E. and W.S.W. direction, and 10 miles broad. The centre of the bank is in lat. 17° 7′ S., long. 36° 54′ W.

The least water found was 28 fathoms, on the eastern edge. The east, west, and north-west sides are steep-to, the soundings deepening suddenly to no bottom with 100 fathoms of line. The bottom is composed of coral intermixed occasionally with moss and weed.

Lieutenant A. Marix, U.S.S. *Philadelphia*, 1892, reports having obtained a sounding of 24 fathoms on Rodgers bank, near its north-eastern limit.

Sulphur bank.—The French Government vessel *Minervé*, passed over this bank in October 1883, obtaining soundings over a distance of 4 miles in a N. ½ E. direction, the least depth obtained was 26 fathoms, coral, in lat. 17° 2′ 50″ S., long. 37° 34′ W. This position is 4 miles to the westward of the position assigned to Sulphur bank on the charts, and on which is the depth of 29 fathoms.

Hotspur bank.—This bank was partially examined in 1852 by Captain H. M. Denham, H.M.S. *Herald*, when depths of 25 to 30 fathoms, coral, were obtained. The *Herald* anchored near the north-west edge of the bank: with the wind at N.E., and moderate weather, no current could be detected, and there was no discoloration nor rippling of the water.

An examination of Hotspur bank by Commander Rodgers, 1877, has shown that the bank is more extensive than was formerly supposed, its length being 22 miles in an E. by N. and W. by S. direction, and its breadth 12 miles; the depths obtained varying from 32 to 48 fathoms coral, with a general depth of 33 fathoms. From the edge of the bank the soundings increase suddenly to no bottom with 100 fathoms of line. The north-west extreme of the bank is in lat. 17° 50′ S., long. 36° 7′ W.

Busbridge bank.—A coral patch of 30 fathoms (Busbridge, 1792) lies due South, about 35 miles from Hotspur bank, in lat. 18° 36′ S., long. 35° 59′ W.

Hogarth bank.—Mr. T. Eddes, commanding the British steam vessel *Hogarth* (1888), reports soundings of 13 fathoms, coral, at 38 miles southward of Abrolhos rocks lighthouse. The weather was clear with smooth water at the time, and the bottom, of coral, was plainly seen; the vessel being stopped, to adjust machinery. Position by reliable observations, lat. 18° 30′ S., long. 38° 21′ W.

Zime bank.—Mr. D. Lloyd, commanding the British barque *Zime*, reports that, about 40 miles south-eastward of Abrolhos rocks, soundings of 12 to 14 fathoms were obtained. The water was discoloured, and the shoal ground was estimated to be 2 or 3 miles in extent. A depth of 37 fathoms was suddenly found in one spot. Position as given, lat. 18° 33′ S., long. 38° 10′ W.

This position is about 10 miles eastward of the 13 fathoms recently reported from the steam vessel *Hogarth*, and may be a part of the same shallow bank.

Unanima bank.—Captain Korf, of the British barque *Unanima* (1891), reports having obtained soundings of 14½ fathoms in lat. 18° 32′ S., long. 38° 23′ W., for a distance of 2 miles in an E. by N. direction, thence deepening to 15, 23, and 30 fathoms, no bottom.

Montague bank.—A bank with 36 fathoms (Montague, 1813) was reported in lat. 20° 18′ S., long. 36° 20′ W., and 16 miles N.W. ¼ W. of this position, a depth of 58 fathoms.*

In 1882 the French vessel of war *L'Eclaireur* obtained 34 fathoms on Montague bank.

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* *See* Admiralty chart:—Victoria to Sta. Catharina, No. 530; scale, m = 0·05 of an inch.

Jaseur bank.—A bank in lat. 20° 34′ S., long. 35° 43′ W., with a depth of 32 fathoms sand and coral, was found by H.M.S. *Jaseur*, in 1825, H.M.S. *Nassau* (1866) found 30 fathoms; and H.M.S. *Dwarf*, 1881, obtained 27 fathoms. This bank is the *Belle Poule*, of the French.

Sylvia bank.—A bank in lat. 20° 3′ S., long. 37° 33′ W., wa examined by H.M.S. *Sylvia*, 1882, the least depth obtained wa 45 fathoms, coral. This bank is the *L'Eclaireur* of the French.

Champlain bank.—The Commander of the *Champlain* ha reported having obtained a sounding of 42 fathoms in lat. 20° 4′ S., long. 37° 32′ W., near the southern end of Sylvia bank. Also, a sounding of 20 fathoms in lat. 20° 20′ S., long. 38° 20′ W., or about midway between Sylvia and Victoria banks.

Victoria bank, lies between the meridians of 37° 3′ and 38° 30′ W., and the parallels of 20° 30′ and 20° 57′ S., having from 40 to 19 fathoms water, coral bottom; this latter depth is near the north-east part of the bank in longitude 37° 22′ W., and close to the north of it the depth is more than 100 fathoms.

Congress bank, an isolated patch of 63 fathoms, lies about 4 miles W.N.W. of the 19-fathom patch on Victoria bank.

Pilot bank lies in a north-east and south-west direction, between the parallels of 21° 40′ and 20° 56′ S., with its south-west end about 60 miles from cape St. Thomé. This bank has from 9 to 35 fathoms water over it, with upwards of 75 fathoms outside it, and a depth of 206 fathoms between it and the bank surrounding cape St. Thomé. All these banks have a hard coralline crust, and are steep-to.*

CAUTION.—Owing to the broken character of the bottom shown by existing soundings, and to the imperfect nature of the surveys, it is probable that many shallow patches exist in the area for more than 200 miles around the Abrolhos rocks, though it is at the same time likely that any dangers would have by this time been seen.

RIVER CARAVELLAS.—The mouth of this river, fronted by sand-banks and reefs, which extend off 4 miles, is about 25 miles southward of the town of Prado. It is about half a mile wide, with

* *See* Admiralty chart:—Victoria to Sta. Catharina, No. 530; scale, *m* = 0·05 of an inch.

village on the north side of entrance. At about 7 miles from the entrance one branch of the river trends to the south-west and communicates with the Perohipe near Villa Viçosa. The town of Caravellas stands on rising ground on the north side of the river, 5 miles from the entrance, and carries on a large trade in farina and coffee, which are extensively cultivated in the district. The population is about 1,000.

Bar.—Channels.—There are four channels through the sand-banks which front the river, two of which only are used by ocean vessels, named the North-East and South-East channels. Both of these, and also the Alagados (a branch of the S.E. channel) are kept well marked by stakes, and are sufficiently wide, with a tolerably direct course, to render navigation easy. From the entrances to the deep water in the river, the distance is 4 miles.

At high-water springs, the least depth in the north channel is 14 feet, the general depth being 16½ feet. In the S.E. channel the least depth is 17 feet, and which is only for a short distance. Vessels of 14 feet draught can pass the bar at almost any high tide, and coasting vessels of 7 feet draught can enter at the lowest tides, at which time the visible sand distinctly outlines the channel.

Harbour.—Inside the bar is a fine harbour, more than half a mile wide, and 6 miles long from the mouth of the river to the upper part of the town of Caravellas, with from 23 to 33 feet, and in places deeper. The terminal station of the Bahia and Minas railway is established on the left bank 2 miles below the town, off which there is roomy anchorage in 6 fathoms at low water.

Tug.—There is a steam tug for the purpose of towing vessels in and out over the bar, under an experienced pilot.

Tides.—It is high water, full and change, at Caravellas, at 4h. 15m., spring rise about 10 feet. The tidal stream varies from 2 to 3 knots, the flood sets to the south, and the ebb to the north, outside the bar; but this direction varies very much with the locality, and force and direction of the wind.

The COAST.—From the mouth of the Caravellas the low shore trends in a south-westerly direction for 14 miles to the little river Perohipe, where on the north bank stands Villa Viçosa, 4½ miles from the bar.* From the mouth of the Perohipe the coast

* Reported (1889) to have extended 3 miles eastward.

continues to the south-west for 15 miles to the bar of the river Mucury, and village of San Jose de Porto Alegre. The river Mucury is navigable for about 50 miles from its mouth. The coast then trends south-west for 8 miles, and thence to the southward for 24 miles to the mouth of the river San Mateo. All this coast is level, and presents a uniform line of vegetation. The Barreiras Velha, 10 miles southward of the Mucury, are reddish cliffs about 100 feet high, and remarkable by their isolation.

Lençol point, at 2 miles southward of the cliffs, is so named from some peculiar white spots seen a few miles from the offing, and which have the appearance of groups of houses. From Lençol point to Rio Doce, at 78 miles farther south, the land is a low sandy plain with scanty vegetation; in many places the coast is composed of yellow sand-hills separating the sea from the marshes and lagoons, and which extend to the foot of the mountains at 25 or 30 miles in the interior. At 2½ miles south of San Mateo are some large white sand downs. This latter part of the coast is visible at a distance of 8 or 10 miles and is clear of danger.

From Rio Doce the coast trends to the south-west and changes its aspect; it becomes more elevated and frequently interspersed with small red cliffs, bordered by a few reefs which extend off about a mile. The high mountains of the Aymores rise from the low land in the interior, and from the south-west is seen mount Mestre Alvaro. Between Rio Doce and Espirito Santo bay, the Sahy, Santa Cruz, Preto, Reis Magos, and Carahipe rivers enter the sea, the latter on the parallel of mount Mestre Alvaro.

Rio San Mateo.—A small island with a village on it forms the northern side of the entrance to San Mateo; inside it are the mouths of four different streams. The entrance is dangerous, with breakers on either side, and has 6 feet at high water ordinary tides and 9 feet at springs. The town of San Mateo is 12 miles from the entrance. At some distance in the interior and a little southward of the bar, there are three small downs, the middle one being the highest; when seen from the eastward they appear as one.

Rio Doce.—The bar of the Rio Seca is about 32 miles southward of San Mateo, and forms a small opening between the trees. The bar of the Rio Doce lies 30 miles southward of the Rio Seca, and carries 13 feet at high-water springs, and 9 feet at neaps; it appears like a large open space between the trees with which the coast is

covered. Inside the bar is a spacious basin. A bank of red sand extends from each point, the breakers reaching out 3 miles; the entrance is partly obstructed by a bank above water. The north point of entrance extends out a little farther than the other and has a large house on it.

The bar of the Rio dos Reys Magos southward of the Doce, has 7½ feet at high water springs, but is dangerous.

Mestre Alvaro mount, is situated about 11 miles northward of Espirito Santo bay; its height (3,214 feet), form, and isolated position, render it equally remarkable; it is nearly the northern termination of the high lands to the southward, and leaves no doubt when in sight as to a vessel's position.

Carapabou shoal, is situated about 2 miles from the shore, and 5 miles north-eastward of Tubaraõ point, entrance to Santo Espirito bay.

ESPIRITO SANTO BAY*.—The entrance to this bay in lat. 20° 19′ S., long. 40° 16′ W. is 2 miles wide between Tubaraõ point on the north-east, and Sta. Luzia point on the south-west. The bay is about 2 miles deep, and in the southern part, in front of the mouth of the river Santa Maria, are two islands with several small islets or rocks.

Mount Moreno.—The base of this mount forms the south point of entrance to the bay and river of Espirito. The mount is conical, partly wooded, 689 feet high, and may be seen in clear weather from a distance of 30 miles. At 5 cables W. by S. is the morro of Nossa Senhora da Penha, a rocky hill, with a convent on its summit.

Dangers.—From Tubaraõ point, which is low and wooded, a reef of rocks extends to the south-east for half a mile, with 6 fathoms water at 1¼ cables southward of them. The north and west parts of the bay are shoal, and the water breaks with south-east winds.

At the distance of 1½ cables north-east of Tarano point is Balea rock, uncovered, with sunken rocks around it; and at about half a mile eastward of the point is Cavallo reef.

A pinnacle rock (locally known as Baixo Pequeno, Little shoal), with 12 feet over it at low water, lies in the approach to port Victoria,

* *See* Admiralty plan:—Espirito Santo bay; No. 546, scale, *m* = 5·0 inches; and plan on chart, No. 529.

with (approximately) Santa Luzia point lighthouse bearing S.W. by S. distant 8½ cables, and Boi island summit W. ½ N.

A dangerous sunken reef lies in the fairway of the entrance to the river, with the inner part of Tubarão point bearing N. by E. ¾ E., and Tarano point W. ⅔ S. The convent of la Penha well open northward of mount Moreno bearing W.S.W., leads one cable northward of the reef; and Frade Léopardo (needle) hill just open to the southward of the western hill on Boi island, touches the south edge of the reef, There is a depth of 9 fathoms close eastward of the reef, and with a smooth sea it is seldom seen, but with strong breezes blowing into the bay the sea breaks on it.

Bar.—A depth of 17 feet will be found on the bar of Santa Maria river at high-water springs, and 15 feet at high-water neaps.

LIGHT.—On the hill of Santa Luzia, on the south side of Espirito Santo bay, is a lighthouse which exhibits, at an elevation of 66 feet above high water, a *fixed* white light visible in clear weather from a distance of 12 miles.

Victoria.—The town of Victoria, capital of the province of Espirito Santo, stands on the north side of the river about 3 miles west of mount Moreno, and less than half a mile westward of a remarkable conical hill, named Sugar Loaf peak, 446 feet high, on the south side of the river. It is partly in ruins, and may contain between 4,000 and 5,000 inhabitants; the population of the province of Victoria is about 65,000. The climate here is humid, caused by the height of the surrounding hills. There is little foreign trade at this port.

Supplies.—Beef of inferior quality may be obtained, vegetables are scarce but good. Coals are dear.

Water may be had by sending canoes a short distance up the rivers.

There is fortnightly communication with Rio de Janeiro.

There are no regular pilots, but masters of coasting craft undertake the service.

Buoys.—Two buoys mark the best channel over the bar; the deepest water is to the northward of them; but little dependence can be placed on their being maintained in position.

Beacons.—A beacon marks the edge of the shoal water in Villa Velha bay, and another is moored off St. Joao's battery near the town.

There is a rock with 9 feet of water on it, about 50 feet south-eastward of the latter beacon. A rock with about 2½ fathoms on it at low water, lies in the anchorage off Victoria, with (approximately) the beacon off St. Joao's battery bearing E. ¾ N. distant 3¼ cables, and College church spire N.W. ½ N.

Anchorage.—Large vessels should anchor in the bay with the college at Victoria in line with Moreno point, in 11 to 13 fathoms, muddy bottom, one mile from the outer sunken reef.

Tides.—It is high water, full and change, at Espirito Santo about 3h., and the spring rise is 4 feet, but the tides are not regular. The tide makes strong at the entrance, especially near Balea rocks.

Directions.—From the anchorage in the bay, steer in north of the outer reef, with Frade Leopardo in line with the north side of Boi island, bearing W. by N. ¼ N. When the battery on the point under the convent of N.S. de Penha opens north of Balea rock, steer with it a little on the port bow, and pass about a cable north of the Balea in 6 fathoms water. To steer in south of the outer reef, bring Frade Leopardo well open southward of the western hill on Boi island, and steer in until the battery is open north of the Balea, then proceed as before.

There is a narrow channel between Balea rock and Tarano point having 13 feet water, and is often used by the pilots. Having passed Balea rock, the route is along the south shore; the depth over the bar will decrease to about 13 feet low water, increase to 16 feet off the battery, and deepen within.

Thence steer north of Pombas islet in the middle of the river, in 5 to 11 fathoms; after passing it, keep close along by the shore of Sugar Loaf peak (Paõ de Açucar) in 6 to 9 fathoms, to avoid the shoal water south-east of St. Joao's beacon; from thence the water shoals to about 3¼ fathoms, deepening again to 3¾ and 4½ at the anchorage off the town.

The ASPECT of the coast between Espirito Santo and Rio de Janeiro is that of a series of high mountains, which at first appear isolated, or united in groups, beginning at the Rio Parahiba near Campos, and forming the great chain extending to the south-westward, and known by the names of serras do Imbè, Macahé, and Orgaos. These mountains are remarkable by their broken pyramidical peaks, such as the frades de Espirito Santo, Itabapuana, the serra do

Pico, the frade de Macahé, and the pipes of the organs of Rio de Janeiro. Their summits vary from about 4,000 to 6,000 feet in height, and may be seen at a distance of 60 to 75 miles; but situated 30 miles in the interior, and the land often covered with a fog or haze, they are not of much use to the mariner for landmarks; it is generally at sunrise when they are seen farthest. The large boggy plains which extend from their base to the coast, form the low land of cape St. Thomé, which is often blended with the sea, and visible only at about 4 or 5 miles.

The COAST.*—Guarapari islets.—At 1⅔ miles south-eastward of mount Moreno are the Pacotes rocks, above water; and at about 6½ miles to the south-west of the Pacotes is cape Jicu. Between, the coast is bordered by several patches of rock at the distance of more than a mile. At about 13 miles southward of cape Jicu, and extending about 3 miles off Puro de Caõ point, is a group of five or six small islets, named Guarapari, with 7 fathoms water close to them; the two largest islets are 2½ miles from the coast, and are visible 10 or 11 miles. Between these islets and the coast there is a passage for small vessels. At about 4 and 5 miles farther south are two other islets at 5 miles from the coast, and nearly on the parallel of the mouth of the river Guarapari. The northern, named Raza, is a flat rock about 10 feet above the water, and divided into two parts; the southern is a round sandy islet, 18 or 20 feet high, named Escalvada. From Perro de Caõ point the coast trends about W.S.W., a distance of 5 miles to the mouth of the Guarapari, thence the coast, composed alternately of small beaches and red cliffs, trends south-westward for 12 miles to Benevente point.

Vessels may pass within the Raza and Escalvada islets in depths of from 18 to 11 fathoms. The coast here is of moderate height, almost covered with small trees, and having in places low yellowish cliffs which are not to be found southward of Benevente point. In the interior of the country are several groups of remarkable mountains, conical, upright, and inclined, which give to this part of the coast an appearance different from that north or south of it.

RIVER GUARAPARI.—The entrance to this river, having 19½ feet water at high water springs, and 18 feet at neaps, is about 30 yards wide, lies W.N.W. 6 miles from Escalvada islet, and enters the sea between two small woody hills. The south point of entrance is

* *See* Admiralty chart :—Victoria to Sta. Catharina; No. 530, scale, $m = 0{\cdot}05$ of an inch.

50 or 60 feet high, and has a church, several houses, and a tall palm tree on it, being the only one in the vicinity of the river; southward of it are some low red cliffs. Vessels of nearly 19 feet draught can enter this river at high-water springs, as there is no surf, and lie moored head and stern in 5 or 6 fathoms water. There is a sand-bank a short distance inside the bar; avoiding this, the water is deep for about a mile up. The village is 3 cables within the entrance on the right bank.

Anchorage.—There is anchorage in the bay abreast Guarapari river in 7 or 8 fathoms water, sheltered from north-east (through north) and south-west winds.

BENEVENTE BAY.*—From Benevente point, the low shore forming Benevente bay, trends to the north-east and thence westward for about 2½ miles to the entrance of the river and town of the same name. From the point, a dangerous reef extends to the south-west for 1½ miles; the outer part of it forms two detached shoals about half a mile in extent, north-west and south-east, leaving a space of nearly half a mile in breadth, having 4½ to 6 fathoms water, between them and the inner part of the reef, the greater part of which uncovers at low-water springs.

The Baixo Grande, the southernmost of these outer shoals, having 3 to 5 feet over it at low water, and 5 or 6 fathoms close-to, lies with Benevente church bearing N. ½ E., and Benevente point N.E. ¼ N. nearly 1½ miles. At 3 cables N.W. of Baixo Grande is Cormorant shoal, a coraline patch of 2½ fathoms, about a cable in extent, and 5 and 6 fathoms round it.

The town of Benevente stands on the east point of entrance to the river, the mouth of which, about 1½ cables wide, is easy of access; the bar has 9 feet over it at springs, 6 at neaps, and only breaks with strong southerly winds. Within the river the depths are 1½ and 2 fathoms. Stocks of all kinds at moderate prices may be procured.

Anchorage.—A good berth will be found in 4½ fathoms, mud and sand; with Benevente church bearing N. by E. ½ E., and the point E. by S. ½ S.

Tides.—It is high water, full and change, at Benevente at 3 h.; and the rise of tide is 5 feet.

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* *See* Admiralty plan:—Benevente to Itapemirim, No. 2,078, scale, $m = 0{\cdot}75$ of an inch; with plan of Benevente bay, scale, $m = 3{\cdot}0$ inches.

Directions.—Coming from the northward, Francesa islet lighthouse may be steered for when bearing W. by S., which will lead about half a mile south of Baixo Grande, or the south Piuma islet bearing N.W. by W. ½ W. will also lead to the southward of the shoals. When Benevente church, which is whitewashed and stands a little above the town, bears N. by E. ½ E., steer for it, and a vessel will pass about half a mile westward of the shoals in 7 to 5 fathoms water to the anchorage.

Piuma.—A small town standing on the south point of entrance to the river of the same name, about 4 miles west-south-west of Benevente. Boats only can enter the river; but there is a well-sheltered anchorage outside for coasting vessels, formed by three islets close together, lying nearly north and south. The water in the river is good, and may be easily procured in fine weather, by anchoring in 4 fathoms, about one mile from the south Piuma islet, or farther out for a vessel of large draught.

FRANCESA ISLET, 150 feet high, and about half a mile in extent, is situated about 7 miles south-westward of Benevente point, and is connected with the shore about one mile distant, by a ridge with depths of one to 2 fathoms.

A reef extends in a north-east direction from the islet a distance of half a mile, with 6 fathoms close to.

Between the islet and Piuma, abreast mount Agha, 820 feet high, a patch of rocks extends about half a mile off shore, and are partly uncovered.

LIGHT.—On the southern part of Francesa islet, from a quadrangular stone lighthouse 38 feet high, is exhibited, at an elevation of 155 feet above the sea, a *fixed* white light, visible in clear weather from a distance of 14 miles.

Anchorage.—There is anchorage in 5 fathoms, in the bight northward of Francesa islet, with the lighthouse bearing about S.S.W. ½ W., distant one mile.

Itapemirim.—A town standing on the south side of the river of the same name about 1½ miles from its entrance, at about 11 miles south-west of Benevente. The bar of the river has 9 feet on it at high-water springs, and 6 feet at neaps; but it is dangerous for boats after strong northerly winds. There are three islets off the mouth of the river, the outer two named White or Moscas islet and Egg islet,

have depths of 4 to 6 fathoms between them, but no vessel should use this passage unless in case of necessity. There is anchorage in 7 fathoms water, mud bottom, with Francesa islet bearing N.E. ½ N., and the entrance to the river S.W.

White or Moscas islet, about a mile from the shore, is about half a cable in length, with a rock about the same distance from its north-east end, and a reef extending a cable from its south-west end, having 6 and 5 fathoms water close to the breakers at its south-west edge. At 3¾ miles E. by S. from White islet, is a bank about a cable in diameter, with 4¾ fathoms water on it.

COAST.—Barreiras de Siry.—At about 3½ miles south-west of White islet, on the summit of a hill, is a remarkable tree. Between latitude 21° 9′ and 21° 12′ are four large red cliffs, separated by narrow valleys, in one of which is the village of Villa Nova. These cliffs, named Barreiras de Siry, form one of the best marks for this part of the coast. Swallow islet lies about one cable from the middle cliff. The coast southward is a low woody plain to within a mile of Itabapuana, at 7 miles farther on.

Banks.—At about 4 miles eastward of these cliffs, a 3-fathom bank is marked on the chart, but its position is doubtful. Beyond the Itabapuana are some low red cliffs, the southernmost on this coast. Retiro or Castellanos point at 3 miles southward of Itabapuana, is surrounded by reefs extending a mile off, and on which the sea breaks.

From the parallel of Benevente to that of Santa Anna islets, in about 22° 25′ S., the coast is backed at from 20 to 25 miles in the interior by a remarkable chain of mountains, leaving between a low extensive plain. Mount Campos, 4,592 feet in height, in about latitude 21° 34′ S., is a remarkable sugar-loaf peak, and when on a W. by N. ½ N. bearing leads to the mouth of the Parahibia do Sul.

RIVER ITABAPUANA.—The entrance to this river is northward of Retiro or Castellanos point and the southern small red cliffs, and will be known by several large white houses on the beach. The bar has 10½ feet on it at high-water springs, and is dangerous with north-east winds. There is anchorage in the river abreast of the village which is on the right bank, in about 4 fathoms.

Itabapuana reefs extend off the shore in a S.E. by E. direction from the bar, to a distance of 2 miles. The outer and largest is 2 cables in diameter, and generally breaks; the other two patches

are nearer the shore. Southward of the reefs, about one mile from the shore, there is a depth of 4 fathoms. There is a channel for small craft southward of the reefs and northward of Castellanos point reefs, but local knowledge is necessary.

To the north-east of the reefs the soundings increase gradually. When standing in for the town during southerly winds, a vessel should pass northward of the reef. Anchor with the north-west breakers bearing S. by E. With northerly winds a vessel should anchor southward of the reefs, with the bar bearing N.W., and distant one mile from the shore. The anchorage is indifferent.

RIVER PARAHIBIA do SUL.—From Retiro point the coast trends about S.W. by S., then E.S.E. to the mouth of the Parahibia do Sul, forming the bay of Sacco do Gargau, which affords anchorage from winds between S.W. and S.E., and is much frequented by coasters. A branch of the Parahibia enters the bay, and affords communication with the town of Saõ João. The Parahibia do Sul has its source in the eastern part of the province of Saõ Paulo, on the north side of the Serra do Mar; it runs first westward, then bends abruptly E.N.E., and enters the province of Rio de Janeiro; after a tortuous course of more than 500 miles it enters the sea at the village of São João da Barra.* The river is much obstructed by sand-banks close down to its mouth, which is named Barra da Campos, and where there is a depth of about 8 feet at high-water springs, but it is dangerous after heavy rains or fresh breezes.

The land here is low and difficult to distinguish. The Barra da Campos is in latitude 21° 36′ S., and will be known from the south-west by a high circular hill with a remarkable mound on its top. On the sand near the mouth of the river is a flag-staff, on which a flag is hoisted when it is practicable to cross the bar in a trading vessel, but which it is difficult to distinguish from the vessel's masts inside, when to the southward; from the north it is very conspicuous, as also the sand where it is erected.

The most convenient anchorage off the bar will be found with the flag-staff bearing between S.S.W. and S.W. Coasting vessels anchor here when obliged to wait for wind and tide to cross the bar. There is a depth of 5 fathoms at one mile from the shore, with good holding ground; but with the wind on the shore there is generally a heavy

* Saõ João da Barra must not be confounded with Barra de Saõ João, between capes St. Thomé and Frio; there are no less than 39 localities named Saõ João on the coast of Brazil.

sea. Discoloured water is found a long way off, but it is deep. There are two channels over the bar marked by stakes on the port hand, and by stakes with branches on them on the starboard hand; the sands are changeable. A pilot attends at the bar to guide the vessel.

Campos.—The town of Campos is situated about 25 miles from the mouth of the river, on the right bank, and is the chief town in the district. It has considerable trade, by means of small coasting vessels, with Rio de Janeiro, to which it exports sugar, cocoa, coffee, spirits, &c. The population is about 17,000.

LIGHT.—From the south side of Parahibia do Sul river entrance, a *fixed* white light is exhibited at an elevation of 42 feet above high water, and should be seen in clear weather from a distance of 12 miles.

CAPE ST. THOMÉ.—The low, uniform sandy shore slightly covered with vegetation known by the name of cape St. Thomé, and about 45 miles from the interior mountains, curves gradually from south round to the westward, having no salient point, and visible only at a distance of 4 or 5 miles. On the southern sweep of the shore, in lat. about 22° 3′ S., is a house visible 5 or 6 miles. At about 6¾ miles to the north-east of the house are three trees higher than the others, and nearly 1¼ miles to the northward of them is a sand-hill.

Light.—A lighthouse, 148 feet high, in the shape of a truncated cone, of a red colour, supported on iron columns, is erected near the south extreme of cape St. Thomé. The keeper's dwelling painted white is in the lower part of the structure.

The light is exhibited at an elevation of 157 feet above high water, and shows white flashes *every minute* with total eclipses, visible in clear weather from a distance of 19 miles.

St. Thomé bank extends off the land in an easterly direction on the parallel of 22° 3′ S. for nearly 10 miles, and its breadth from the 6-fathoms line of soundings along each side of it from north to south, varies from a half to 2½ miles. In this space the sea breaks heavily in different places with north-east winds, but seldom with north-west winds, having between the breakers depths of 3 to 7 fathoms. It is steep-to; on the north side there are depths of 7 and 8 fathoms close to the breakers, and on the south 7 to 13 fathoms

within half a mile. The outer breaker is about 9 miles from the shore, and between 1½ and 3 miles east of it, from 11 to 14 fathoms water. The inner breaker is 2 miles from the shore, and about three-quarters of a mile inside it is a channel carrying from 3 to 5 fathoms water. The current in this vicinity is often rapid, and depends on the force and direction of the wind.

The following soundings were obtained with a Thomson sounding machine, by the Messageries Maritimes steam vessel *Equateur*, 1891, eastward of cape St. Thomé, Brazil :—

7⅔	fathoms,	fine sand	..	in lat.	21°	56′	30″	S.,	long.	40°	37′	15″ W.
7⅓	„	„	„	„	„	22°	0′	0″	S.,	„	40°	40′ 45″ W.
21	„	coarse sand, &c.		„	„	22°	5′	0″	S.,	„	40°	40′ 45″ W.
27	„	„	„	„	„	22°	9′	0″	S.,	„	40°	40′ 45″ W.

The COAST.—From cape St. Thomé the low sandy shore trends in a south-westerly direction, and at the distance of 6 miles from the isolated house on the southern sweep of the shore, is the Barra Iguassu, leading into the river of that name, and 3 miles beyond it a remarkable cocoa-nut tree. At three miles westward of the cocoa-nut is another tree, with four or five houses, between two outlets from lake Feia. During the rainy season this lake forces its way to the sea through several openings, the principal of which is named Barra do Furado situated 12 miles west of the cape, and with several fishermen's houses around it ; at 33 miles farther west the mouth of the Rio Macahé, having south-east of it a small islet named Papagayos, and E.S.E. distant about a mile from the latter, is a rock, barely awash and does not break, with 5 to 8 fathoms water close to it.

The eastern part of this low shore is named the Praia do Furado, and the western the Praia do Paulista. The whole is clear of danger, with the exception of Hermes rock, N.E. by E. ½ E., distant 3¼ miles from Papagoyos islet. From the mouth of the Macahé the coast trends to the south-westward for nearly 13 miles to that of the Rio das Ostras, on the south side of the point with three small islets of the same name off it. Between, is point Pecados Mortaes, a spur of the Serra de Iriry ; northward of this point the shore is named the Praia das Pedrinas, and southward of it Praia Iriry ; this latter part is foul, and sunken rocks lie off, from 1½ to 2 miles from the beach. There is also a sunken rock 2 miles north of point Pecados Mortaes, at three-quarters of a mile from the shore. It is not advisable to approach within 3 miles.

From the mouth of the Rio das Ostras, the shingle shore curves to the southward and eastward for about 18 miles, to cape Busios, a high, bold point projecting northward, and forming Santa Anna bay. The rivers San João and Una fall into the sea between the Ostras and the cape. The serra do San João, 2,658 feet high, north of the river of the same name, and about 3½ miles inland, is an isolated conspicuous mark, and 20 miles northward of it is the Frade de Macahé, 5,740 feet high, a remarkable peak leaning to the northward, with the serras of the same name extending to the south-west, and those of the Imbé to the north-eastward.

From the Barra do Furado towards the Santa Anna islets the depths are regular, there being from 9 to 12 fathoms, sandy bottom, at 5 or 6 miles from the land; outside this distance the bottom is gravel, sand, and shells. At 12 or 15 miles from the coast, to a distance of 6 or 7 miles from cape Busios, there are depths of 22 to 27 fathoms, muddy bottom. At more than 15 miles from the coast the soundings in places are irregular.

Hermes rock is about 12 yards in extent, N.N.W. and S.S.E., and 4 yards wide. It rises almost perpendicularly from the bottom, forming three heads; on the south-east of which the depth is 4 feet, and on the two others 10 to 14 feet at low water. The bottom around is mud, and the depths 5 and 6 fathoms, excepting for 54 yards in a north-east direction from the rock, where the depth is 4 fathoms and the bottom coral. The water over the rock does not break. From the rock, which is distant 1½ miles from the beach, the church of Santa Anna bears W. by S.; north-eastern Santa Anna islet, S. by E. ½ E., distant 3½ miles; and centre of Papagayos islet S.W. by W. ⅓ W., 3¼ miles.

The church of Santa Anna stands southward of the centre prong of the Iriry mountain. This mountain is small, detached, has four peaks, the centre being the largest and highest, and rises inland a short distance south of the port of Macahé. Imburo hill rises a little north of the town of Macahé, is the largest hill in its vicinity, and its summit is covered with wood and inclines to the south. Deitado hill is in the same direction as the preceding one, a little more inland, and having a large spot on it is easily recognised.

When bound to the northward from the anchorage off Macahé, to avoid the Hermes rock, do not steer to the N.E. until the vessel is eastward of the Santa Anna islets. If it is necessary to tack, in making the northern board, the church of Santa Anna should not be

brought on with Iriry mountain until the vessel is eastward of the meridian of the islets.

MACAHÉ.*—The mouth of the river Macahé lies about N.W. ¼ W. distant 4¼ miles from the largest of the Santa Anna islets, and which serve to identify it. A small fort stands on the southern point of entrance. The river is about 70 yards wide, and admits vessels of 9 feet draught at high water. The town of the same name, consisting of about 150 houses, stands on rising ground near the mouth of the river, where also, near the summit, is the church and flag-staff. If the flag be hoisted, it is a signal that the entrance is safe. In the river, water may be obtained in any quantity; and small craft can proceed up about 30 miles. At times the water from the river causes the sea in the vicinity of Santa Anna islets to be much discoloured, like that of a sand-bank.

Tides.—It is high water, full and change, at Macahé at 2h. 50m., springs rise 4½ feet.

Imbetiba is a small bay situated about half a mile south of the river Macahé, the harbour of Imbetiba, is a free port, with a breakwater and piers. The principal pier is 500 feet long, with three cranes, capable of lifting a weight of 5 tons; there is a depth alongside the pier of about 16 feet at low water. The railroad runs on the pier, receiving cargo directly from the vessels. There is also a jetty, near which there is 16 feet at low water. The anchorage in the port is not considered secure during the months of August and September. Vessels proceeding to Imbetiba have to clear inwards, at Rio de Janeiro, unless loaded with coals, and direct from Europe.

Pilots can be obtained off Santa Anna island.

SANTA ANNA ISLETS.—At the distance of about 21 miles N.E. by N. from cape Busios, and 4¼ miles from the entrance to the Macahé, are five small islets, named Santa Anna, lying in a north-east and south-west direction over a space of 2¼ miles. The centre islet, 492 feet high, is the largest. Two rocks above water lie off the north-east end of the easternmost islet, from which a shoal extends to the northward nearly a mile, with 10 feet water on it. The channel inside them is impeded by a bank extending from the north end of the largest islet to the main, with 3¾ to 5 fathoms water over it, the greatest depths being about halfway across. The bank is

* *See* Admiralty plan :—Macahé anchorages on chart No. 530; scale, *m* = 3 inches.

steep-to on both sides, the water shoaling from 7 to 5 and 3¾ fathoms. With the exception of this bank the soundings round the islets are regular.

Anchorage.—On the west side of the islets there is anchorage in 5 to 7 fathoms water, sheltered from easterly winds, but exposed to the south-west and north-east: with the latter there is seldom much swell. The best route to this anchorage is round the southern islet, which is clear of danger.

Anchorage will be found with the south-west part of the large islet bearing S. ¼ W.; and the northern part E. by S. ¼ S., in 7 fathoms water, about three-quarters of a mile from the sandy beach. Large vessels should anchor farther to the southward, with the south-west point of the large islet to the eastward of S.E., distant one mile, in about 7 fathoms; as the water shoals suddenly on the south-west side of the bank, and likewise towards a sandy beach on the large island.

About the middle of the sandy beach of the large islet, there is a passage through the trees to a well of water; firewood may be obtained here in any quantity close to the beach, and it is said that coasters may careen here.

Tides.—It is high water, full and change, at Santa Anna islets at 2h. 30m., springs rise about 9½ feet.

SANTA ANNA BAY.—Rio das Ostras, enters the sea in Formosa Bay, the northern part of Santa Anna bay; the anchorage off which sheltered by the point and islets to the eastward, is much frequented by coasters of 10 to 12 feet draught, trading to Rio de Janeiro.

Barra Saõ João, situated 5 miles south of Rio das Ostras, and 10 miles from cape Busios, has about 12 feet on the bar at high water, which is one of the best on this coast. It is much frequented by coasters. The population of the town and district is about 5,000.

Busios (Armacao) bay,* westward of cape Busios, affords sheltered anchorage to vessels from south-easterly winds, in 4 to 8 fathoms, muddy bottom.

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* *See* Admiralty plan:—Busios anchorage; scale, *m* = 1·5 inches, on chart, No. 530.

Islets.—Rocks.—A small islet named Branca or White islet, lies at the eastern entrance to the anchorage; and at 2¼ miles westward of it is Feia islet, 295 feet high, and wooded, with a rock off its north-east side, at the distance of 3 cables; and at the distance of three-quarters of a mile in the same direction, is a rock which partly uncovers at low tides, with 11 fathoms close to it. The highest peak of Ancora islet, east of the cape, in line with the north-east side of Branca islet, leads on the rock. Ancora islet open northward or southward of Branca islet, leads clear of it. The passage between Branca islet and the main should not be used in a sailing vessel unless with a fair wind; with steam it may be taken at any time.

João Fernandez reef, which breaks, is situated 2 cables south-east of the point of the same name at about one cable from the coast.

Busios bay has a white sandy beach. In the western part of it is Raza islet, with breakers extending about half a mile east-south-eastward; and at half a mile northward, and nearly the same distance off Diego point, is Coboclo rock or islet.

Anchorage, open to northerly winds, will be found north-west of the village of Busios in 7 fathoms, about 3 cables from the shore.

The village consists of about 30 houses. Water, in small quantities, fruit, and poultry may be obtained.

ANCORAS ISLETS.—At about 5 miles E.S.E. from cape Busios is the eastern and largest of two islets, seen at a distance of 20 to 25 miles in clear weather, named Ancoras or Anchor islets. To the southward of the inner one is a large white rock, and connected to it by a reef. The eastern islet, 360 feet high, is said to resemble a cardinal's hat. Between the islets there are depths of 23 or 24 fathoms, and in mid-channel between cape Busios and the inner Ancoras, from 18 to 21 fathoms.

The COAST.—Islets.—From Criminso point, 344 feet high, at 1¼ miles S.S.E. of cape Busios, the bold coast trends to the south-west for nearly 2½ miles to Geriba point; between are two little bays with the small islet of Boi at the entrance to the northern one; in the southern bay is a sandy beach named the Praia do Ferradura. Xerne point is 11 miles south-west of that of Geriba; the coast between forms an indentation of about 3 miles deep with three semicircular bays, whose beaches are named respectively Praia do Geriba, Praia do Perdido, and Praia do Pontal; Emerina point.

separating the two first bays, is 525 feet high; two rocks above water lie off the point, and a sunken rock a mile eastward of it.

Pero point divides the second and third bays; the shore is bold from thence to the south-west for 2 miles, as far as the Barra Nova, the entrance to Araruama lagoon at the north end of Pontal sandy beach. Here is the village of cape Frio, with a small fort. Between Geriba and Xerne points, but chiefly fronting Perdido bay, are several islets extending 5¾ miles in a S.W. by W. ½ W. and N.E. by E. ½ E. direction, and in line with the outer Ancora islet. These islets, beginning from the north-east, are named Brew, Pargos, 213 feet high; Cavallos, Comprida, the largest and 357 feet high; Irmaõs, and Papagayos 377 feet high; they are clear of danger, and 20 fathoms water will be found at a distance of about 2 miles.

Araruama lagoon extends nearly parallel to the coast for 21 miles westward of cape Frio, with a breadth varying from a half to 7 miles. There is a depth of 9 feet at the entrance, which lies 8 miles north of cape Frio; the navigation of the lagoon is intricate, but there is a depth of 6 feet to the town of Port Frio, 2 miles within the entrance, and which town is connected with Rio by telegraph.

CAPE FRIO, the southern extremity of the island of the same name, is high, rugged, and remarkable in its outline; it forms the elbow of the province of Rio de Janeiro, is the south-eastern extremity of the coast of Brazil, and may be seen in clear weather from a distance of about 45 miles. When seen from the east or west the island appears like two mountains, the northernmost being about 1,570 feet above the level of the sea, and the southern one 1,300 feet. On a N.N.E. and S.S.W. bearing, they appear as one mass with a double summit like two small points.

At about three-quarters of a mile north-east of the cape is a small islet close to the shore; and at nearly a cable southward of the cape is a rocky patch with 2½ fathoms water over it. The 100-fathoms line of soundings curves round the cape eastward of it at the distance of about 70 miles, and southward of it at 35 miles, and there are depths of from 30 to 50 fathoms at 2 miles from the land.

Electric Telegraph.—Vessels bound to Rio de Janeiro on approaching cape Frio, are required to indicate by means of the International code of signals the following particulars, namely,—Ship's name, port of departure, days of passage, cargo on board,

consignee's name, shipping and commercial news. This information will be transmitted to the exchange at Rio de Janeiro by the electric telegraph established at cape Frio. When passing at night or in foggy weather, such news to be furnished to Punta Negro or Santa Cruz stations. Vessels not possessing the signals, may still anticipate the news of their arrival at Rio de Janeiro by writing the same information in large white letters on a black board, and hanging it on the ship's side passing fort Santa Cruz at the entrance of the harbour, when the telegraph therein established will convey the news to town.

The signal-station near cape Frio is situated on a hill, about 3 miles N. by W. of cape Frio lighthouse, near Nostra Sa des Remedios. It consists of a large white house with a red roof, and a flagstaff on each side.

LIGHT.—On Focinho do Cabo point, the southern extreme of cape Frio island, is a round tower 53 feet high, painted light stone colour, which exhibits at the height of 300 feet above the mean level of the sea a white *flashing* light *every minute and a half*, visible seaward through an arc of 225°, or between the bearings of S.W. ⅓ W. and E. ⅓ S. The duration of the eclipse is 45 seconds, and the exhibition of light which gradually attains its greatest brilliancy, is 45 seconds. The light should be seen in clear weather from a distance of 25 miles. Reported irregular, 1892.

The light is not visible in the vicinity and westward of Ancoras and Papagayos islands.

PORT FRIO,* on the north-west side of cape Frio island, is a secure anchorage, except with north-east winds. The harbour is about a mile in length and breadth, having 6 to 16 fathoms water; the holding ground is moderately good. The entrance between the north end of the island, and isle dos Porcos (360 feet high), is about 7 cables wide, with 15 to 20 fathoms, over fine sand and mud. There is a narrow channel to the anchorage close westward of cape Frio island, of about 2¼ fathoms, between the island shore and the sand-bank forming the west side of the channel. This bank, on the shoalest part of which there is a depth of 6 feet, continues to the shore, and forms the western side of the anchorage; it breaks with N.E. winds. There is also a narrow entrance with depths of 10 and 12 fathoms, at the south-west end of cape Frio island, between

* *See* Admiralty plan :—Port Frio; scale, *m* = 1·7 inches on chart No 530.

it and the continent, leading to the same anchorage, where there are depths of 8 and 10 fathoms.

In N.E. winds, the small steamers that carry on the coasting trade with the northern ports, make use of this channel between cape Frio island and the main ; and by keeping very close to the island shore, carry about 13 feet of water, by which means they escape the westerly currents then prevailing. It must be remembered that a telegraph cable stretches across the channel at the height of 90 feet above the sea.

A small fort in ruins stands on point St. Sebastiaõ, a rocky point between two sandy coves on the north-west side of the harbour ; and a little within the fort at the bottom of Praia do Angra, is the village of Nossa Senhora des Remedios, or Cabo Frio, occupied chiefly by fishermen (about 300), where fresh provisions may be obtained.

Anchorage.—The best anchorage in Port Frio is in Praia do Forno, midway between St. Sebastiaõ and Angra (Agoa) points, in about 7 fathoms, or farther in.

H.M.S. *Mallard* anchored here in 1879 and found it a secure anchorage, but recommends mooring with open hawse to the eastward, as the wind comes in puffs from the N.E. over the hills, and the anchorage ground being limited, leaves little room to drag.*

This anchorage is used by vessels of war, stationed at Rio, as a health resort.

The best landing is just within and northward of St. Sebastiaõ point, whence a path leads to the village.

Water may be obtained from wells in the coves as well as on the island near its west end. Abundance of fish may be taken by the seine in the coves.

Tides and currents.—South-west and north-east winds produce north-east and south-west currents, from a half to 1½ miles an hour. With south-west winds, there is a south-west eddy inshore, the currents usually precede the winds. It is high water, full and change, at port Frio, at 2h. 40m., springs rise 5 feet ; south-west winds raise the water 2 or 3 feet.

Winds.—The winds off cape Frio are seldom found to the southward of East ; and in the northern monsoon they are generally to the northward of N.E. Heavy squalls are occasionally met in rounding the cape, which require every precaution to guard against.

* Remark Book, H. Sabben, navigating officer of H.M.S. *Mallard*, October, 1879.

The COAST.—Negra point.—From cape Frio to the entrance of Rio de Janeiro the course is about W. ½ N. and the distance 63 miles. The coast between is everywhere steep-to and consists of a yellow sandy beach, backed by high land a few miles to the northward, showing in peaks and hills. At about 26 miles eastward of Rio de Janeiro, the sandy beach is interrupted by Negra point, a dark level piece of land about half a mile in extent and some 80 feet high, which terminates abruptly, and may be recognised by the land at its back being very high and dark, with more irregular hills to the eastward. At 10½ miles eastward of Negra point on a sandy hill, is a church dedicated to Nossa Senhora de Nazareth, and being white forms a conspicuous mark to the offing.

The shore is here named Masambaba, and within it is the Araruama lagoon. Between cape Frio and Negra point at the distance of 5 miles from the coast, the depths are from 31 to 38 fathoms, sand, gravel, and broken shells, and at about 40 miles from the shore is the 100-fathoms line of soundings. North of the Maricas islets, near the beach, and 3 or 4 miles eastward of the False Sugar loaf, is a round remarkable hill, about 850 feet high, with the western side of its base level with the low land, and much resembling Redonda island. This hill will point out the position of the Maricas islets.

MARICAS ISLETS.—At 14 miles westward of Negra point, and about 3 miles from the beach, are two islets, named the Maricas, about 120 feet in height, and may be approached with safety. The water near the islet is deep, and there are no dangers but what are in sight. On the eastern side the sea commonly breaks with great violence. Between the islets and the main there are 13 and 10 fathoms water, close to the beach. Temporary anchorage, with fine sandy bottom, will be found westward of the islets with northerly winds; the best position is in about 15 fathoms, with Negra point in line with the northern islet; and the south islet S.E. ½ S. distant about one mile. There is landing near the north-west end of the larger islet.

CHAPTER V.

RIO DE JANEIRO TO CAPE CASTILLO AT THE ENTRANCE TO THE RIO DE LA PLATA.

Variation in 1893.

Rio de Janeiro -	6° 0′ W.	Rio Grande do Sul -	3° 30′ E.
Santos bay - -	3° 0′ W.	Cape Castillo - -	5° 10′ E.
S. Catharina island -	0° 0′ E.		

RIO de JANEIRO HARBOUR.*—This harbour is one of the largest in the world, and can scarcely be excelled. It covers a space of about 16 miles in a north and south direction, gradually widening from about three-quarters of a mile at its entrance to 15 miles at its head, where it extends W.S.W. and E.N.E. It is interspersed with numerous islets, surrounded by high wooded mountains which terminate in an easy declivity to the sea; its shores are scattered with villages, country seats, and various plantations; many rivers run into the harbour, and around it are several sandy bays. The entrance is bounded on the west by the base of the Paõ de Açucar or Sugar loaf, with fort San Juan immediately within it, and on the east at 9 cables from the latter, by fort Santa Cruz at the foot of a mass of granite.

There are no dangers in entering the harbour; the least water is 5½ fathoms, at nearly half a mile south of fort Santa Cruz; and for a distance of 2½ miles outside the forts there are from 7 to 10 fathoms; between the forts there are from 12 to 26 fathoms; and within, deep water all the way to the anchorage off the town. To the northward of the anchorage the water continues deep, and the harbour is navigable for small vessels in every part of it.

* *See* Admiralty charts:—Rio de Janeiro harbour, No. 541, scale, $m = 0{\cdot}72$ inches; with enlarged plan of entrance: and Victoria to Sta. Catharina, No. 530, scale, $m = 0{\cdot}05$ inches.

The city of Rio de Janeiro, capital of the province, and the most important town in Brazil, stands on the western side of the harbour, at about 2½ miles from its entrance, at the foot of a high range of mountains named the Corcovado, which bounds the plain on the west. It is built on level ground somewhat in the form of parallelogram, and from the harbour has a most pleasing appearance. The streets are straight and well lighted, intersecting each other at right angles, paved with granite from the adjacent quarries, and well drained. The houses are mostly built of granite, seldom more than two stories high, rough or whitewashed, with red tile roofs.

The older portion of the city, or that adjoining the sea, is divided on the west from the new town by the large open space named Campo de Santa Anna. Parallel with the beach is Primero do Marco, the main street. The royal palace forms two sides of an oblong space open to the sea, near the landing place. It consists partly of the old palace of the viceroys, and partly of a convent formerly belonging to the Carmelites, and is without architectural beauty. Among the other public buildings is a handsome theatre, the exchange, the old college of the Jesuits, and the episcopal palace, and royal villa of Christovao, in the environs.

The city contains about 60 churches and chapels; of these that of Nossa Senhora da Gloria is one of the finest, and occupies a site on a lofty hill that juts into the sea between the city and Praia Flamingo, and is a conspicuous object from the harbour. From the city the suburbs extend westward; and to the southward along the west side of the harbour to Botafogo. Water is supplied from the Corcovado mountains by a magnificent aqueduct; it is thence conveyed to public fountains in different parts of the city, and families supplied by carriers. There is a railway to the summit of Corcovado for the conveyance of excursionists.

The botanical gardens, about 8 miles south-west of the city, is a place of great resort. In the rear of the town are several ranges of hills which shoot off in irregular spurs from the neighbouring mountains, leaving between them flat intervals of greater or less breadth. Along the bases of these hills and up their sides, are rows of buildings whose whitened walls and red tiled roofs form a pleasing contrast with the deep green foliage that surrounds them. Small steamers ply regularly between Rio and Nitheroy on the opposite side, and to Piedade at the head of the harbour.

The population of the city of Rio Janeiro is about 350,000 inhabitants.

Imports, exports.—The principal articles of import are cotton and silk manufactures, flour, wine, &c.; and the exports are coffee, sugar, hides, and tobacco. The value of the imports (1888) is about £15,000,000, and the exports £10,772,000.

Landing should be effected on the north side of the steam ferries, as that on the south is used for embarking yellow fever and small pox cases for transit to the hospital on the east side of the harbour.

Time signal.*—The signal is made from the Observatory on mount Castello by means of a red drum. It is expanded to its proper size at 5 minutes before noon, and collapsed at noon—Rio de Janeiro mean time—equivalent to 2h. 52m. 41·4s. Greenwich mean time. From telegraphic measurement made in 1878-79 by Lieutenant Commanders F. M. Green and C. H. Davis, U.S. Navy, in connection with the Royal Observatory at Greenwich, the longitude of the Observatory on mount Castello has been determined to be 43° 10′ 21″ W. This places fort Villegagnon in longitude 43° 9′ 31″ W.†

The firm of Ferdinand Rodde and Co., by permission of the authorities, have established telephonic communication between their office and the Observatory, and masters of vessels may obtain the errors of their chronometers daily, free of charge.

Supplies.—All kinds of supplies can be obtained in abundance at Rio, and the port is preferable to any on the coast. Ships in want of repairs can be accommodated; there are several steam factories, and building slips and docks which will take vessels of large draught. Water is supplied from floating tanks, both for vessels of war and merchant vessels. It is not considered fit for drinking purposes, and is only used by H.M. ships for washing and filling boilers. Merchant vessels, calling for refreshments only, are allowed to enter the harbour, without paying anchorage dues, but are subject to all other port charges.

Coal.—Mucangue Pequena (Coal island) is the principal coal depôt, and there is every facility for vessels of any size coaling alongside.

Vianna island, situated a quarter of a mile north-eastward of Coal island is also a depôt for coal.

About 15,000 tons are usually in stock at Rio; 800 tons can be put on board per day alongside the wharf at Coal island. Vessels in the

* Reported not to fall on Sundays and holidays.
† The fort is 3·3 seconds east of the Imperial Observatory.

anchorage are coaled by lighters, which are towed alongside, and with but little interruption from the weather. The contractor communicates with H.M. ships, on arrival.

Docks.—On the north side of Ilha das Cobras are two Government docks. The dimensions of No. 1, named the Imperial dock, are as follows :—Total length 423 feet, length on blocks 392 feet; width at coping 92 feet, width on floor 59 feet, width at entrance 70 feet; height 33 feet; depth on blocks at high-water springs 24 feet.

No. 2, or Santa Cruz dock :—Total length 258 feet, length on blocks 240 feet; width at coping 70 feet, width on floor 35 feet, width at entrance 55 feet; height 28 feet; depth on blocks at high-water springs 20 feet.

On Coal island, on the eastern side of the harbour, there is the Commercial dock, owned by Messrs. Wilson and Co.; the following are the dimensions: length on blocks 405 feet; width at coping 60 feet, width at bottom 30 feet, width at entrance 45 feet; height of floor to coping 23 feet; depth on blocks at high-water springs 18½ feet.

The Saude dock, owned by Messrs. Finnie, Kemp, and Co., is situated on Saude point, one mile westward of Ilha das Cobras :—Length on blocks 400 feet (in 1883), when finished to be 500 feet; width at top 92 feet, width on floor 66 feet, width at entrance 70 feet; depth on blocks at high-water springs 24 feet. This dock is in constant use.

There is a small patent slip on Enchadas island.

A Quarantine station for the port of Rio has been established at Albrahoa bay, Ilha Grande, about 60 miles to the westward of Rio. A landing pier about 66 yards long, with crane, and also a semaphore for communicating with vessels has also been established there. *See* page 177.

Forts.—Islets.—At 3 cables north-east of Fort San Juan, the west point of entrance to the harbour, is a low square fort with flag-staff, named Lage, standing on some isolated rocks, on which, in strong breezes, the sea breaks with violence; a sunken ledge extends one cable westward of it. At 1½ miles farther in on the west side, is the village and fort of Villegagnon, standing on the edge of a bank of shoal water which skirts the west side of the harbour from fort San Juan to Ilha das Cobras.

Fort Santa Cruz, on the east point of entrance, forms the principal defence of the harbour, and is a work of considerable strength; it is

flanked by batteries on the east and west, and protected by a regular front of musketry on the land side.

Ilha das Cobras or Serpents island, at the north-east part of the city, is strongly fortified; the highest part being nearly 80 feet above the sea. The island slopes gradually on the east side to the water's edge.

A bar of sand with some rocks extend to the south-east from Cobras for a distance of half a mile, fronting the city and leaving a small passage between the south end and Calhabouco point. The least water on this bar is 6 feet; at low water with a heavy swell the sea breaks on it, and renders it dangerous for boats passing across; between the bar and the city there are from 2 to 7 fathoms.

Rat island.—About 2 cables off the east end of Cobras is Rat island with some rocks between. A patch of 21 feet, marked by four red buoys, lies N. by E. nearly 2 cables from Rat island. There are several minor fortifications in other parts of the harbour.

Enchadas island, situated 6 cables north of Ilha das Cobras, is nearly round, and about 200 yards in diameter. Off its west side a shoal extends to the distance of half a cable; the extremity of the shoal is marked by a buoy surmounted by a flag. Also a patch of 21 feet lies 2 cables north-west of Enchadas, and a patch of 2 fathoms at one cable distant.

Four can buoys, painted yellow, and surmounted by staff and globe, have been moored at about equal distances apart, to mark the direction of the water-pipes laid between Enchadas and Cobras islands. Anchorage near the line of these buoys is prohibited.

Feiticeiras bank.—Eastward of Enchadas, 3 cables distant, is Feiticeiras bank, a nearly circular rocky shoal about a cable in diameter. An iron rod beacon, surmounted by an iron flag, is erected on the bank, and five red buoys mark the edge of the bank in 5½ fathoms, each about one cable distant from the beacon. Also two red buoys are moored respectively on the bearings N.E. and E.N.E. distant 2¾ cables from Feiticeiras bank. About 120 yards southward of the bank is a patch of 2 fathoms depth.

Lecky rock lies E. by S. ½ S. about a cable distant from the jetty on the east point of Enchadas island; it is 50 feet in diameter, conical, with 2½ fathoms on it at low water springs, and is steep-to on all sides; its east side is marked by a red buoy, surmounted by a ball.

A red buoy with flag, lies about 1½ cables southward of Enchadas island, and a similar one about 4 cables southward of Feiticeiras bank.

There is a deep channel to the westward of the rock, but vessels proceeding to the wharves which are situated on the north side of Enchadas island, are recommended to pass outside, or to the eastward of Feiticeiras bank.

Anchorage.—Vessels of war anchor anywhere eastward of the city, but southward of a line drawn from Rat island to the largest church having two towers, and with the Paõ de Açucar or Sugar loaf open eastward of fort Villegagnon, in 15 to 21 fathoms water, muddy bottom; or more westward if convenient, with the Sugar Loaf over the western house in fort Villegagnon in 7 or 8 fathoms. Several sets of mooring for vessels-of-war are laid down between Rat island and Villegagnon. Vessels generally moor open hawse to th south-west. Merchant vessels anchor on first arrival, below Villegagnon fort (*see* footnote, page 173); afterwards northward of Ilha das Cobras, in 5½ or 6 fathoms; and coasters off the city southward of Cobras. Vessels are prohibited from anchoring in the fairway of the ferry steamers plying between the city and Nitheroy The authorities require all vessels to have buoys on their anchors.

There is also anchorage between fort Santa Cruz and Jurujuba bay, on the eastern side of the harbour, in 5 or 6 fathoms water.

ISLANDS off the ENTRANCE.—Several small islands lie off the entrance to Rio; on the east side are those of Pay and Mai (Father and Mother); the former lying 4 miles south-east of fort Santa Cruz, and the latter three-quarters of a mile more to the eastward, with a depth of 20 fathoms between them. A reef extends from the north-east end of Mai island, with a depth of 20 fathoms between it and Menina island close to the shore. These islands are otherwise steep-to.

Raza island, about 4 cables in length, and about 270 feet high lies S.W. ¼ S. 5½ miles from Pay island, and when seen from the eastward appears wedge shaped, sloping part northward. A square white light tower, 50 feet high, stands in the centre of the island, and there is a flag staff, with a landing place at the north-west end. An islet lies close off its north point. The depth of water between this island and Pay is from 19 to 26 fathoms, gray sand and mud.

Redonda island, 726 feet high, and conical, lies about W. ½ S. 2½ miles from Raza, with about 30 fathoms water between them. A small islet lies at the distance of one cable from its south-west side; and about a mile south-west from the summit of Redonda is a dangerous reef, with a rock 6 feet high on it.

At 1¾ miles northward of Redonda is Comprida island, with about 20 fathoms water between them; and close to the north of the latter are Palmas and Cagada. At half a mile E.N.E. of Cagada, the easternmost of these islands is a rock 20 feet high, and between Cagada and Comprida are two reefs.

On the west side of entrance to the harbour at 6½ cables southward of the base of the Sugar loaf, is an island named Cotundubu or Tucinho, 228 feet high, having between 9 to 13 fathoms water, over sandy bottom. A reef extends a little southward from the island, with 9 fathoms close to.

LIGHTS.—The light tower on Raza island is 50 feet high and exhibits at the height of 315 feet above high water, an electric *revolving* light, showing *two white flashes* and *one red flash* of about *four seconds* duration each, with an interval of about *eleven seconds* between each flash. The light should be seen in clear weather from a distance of 24 miles.

At fort Santa Cruz, on the eastern side of entrance to Rio de Janeiro harbour, is a *fixed* white light, visible 6 miles.

On Calhabouco point at the south-east extreme of the city, is a small *fixed red* and *green* light, exhibited on a pole. It is *green* from seaward as far as the line joining the light and the hospital on Jurujuba point; and *red* northward of that line.

On fort Villegagnon is a *red* fixed light, exhibited from an iron column, over an arc of 225°, or between the bearing of N. 28° W. and S. 73° E., and is visible 7 miles.

Tides.—It is high water, full and change, at Rio de Janeiro at 3h.: springs rise 4 feet and neaps 3 feet. The usual rate of the tide is about three-quarters of a mile an hour, springs run 1½ miles. The ebb runs much longer than the flood, especially after heavy rains, and it has been known to run a whole day without intermission: strongest on the western side, but an eddy will sometimes be found on the eastern side, when the water is observed to rise. At the anchorage in front of the town the stream is occasionally irregular. Outside the entrance, the ebb is stronger on the western shore.

Winds and weather.—In the harbour the sea breeze generally sets in between 10 a.m. and 1 o'clock, and ceases in the evening between the hours of 7 and 11. The land wind blows all night, ends at 9 or 10 o'clock in the morning, and is succeeded by an interval of calm. At the full and change of the moon, heavy squalls from the north-west, named "Terre Altos," sometimes succeed the sea breeze, lasting from four to six hours. The south-west is the bad weather quarter in Rio harbour, the wind blowing in fierce and dangerous squalls with much rain; thunder storms occur most frequently in the summer, generally with winds from N.N.W. and West, and rarely with those from East or South; when the outline of the Organ mountains, which bound the northern side of the harbour, is clear and sharp, rain may be expected. April, May, and June are the rainy months.

Landmarks.—The entrance to the harbour of Rio Janeiro is known by several remarkable mountains in its immediate vicinity. The Paõ de Açucar or Sugar loaf rises in that form from a tongue of land on the west side, to the height of 1,270 feet, and differs from the many others on this coast by the inclination of its summit to the westward. At 2¾ miles westward of the Sugar loaf is the peak of the Corcovado, 2,272 feet high; thence the mountain range trends in a westerly direction for a distance of 5 miles, to mount Gavia, 2,575 feet above the sea, with a remarkable flat top, with perpendicular sides, seen in all directions seaward from east to south-west, and cannot be mistaken.

When the summits of these mountains are free from clouds they present in a remarkable manner the figure of a man lying on his back, the Gavia forming the head and the Sugar loaf the feet. On the eastern side of the entrance, at 6½ miles eastward of fort Santa Cruz, at the western termination of the high land, is the False Sugar loaf, rising close to the shore to the height of 1,317 feet. At 3 or 4 miles east of the False Sugar loaf is a remarkable round hill about 850 feet high, sloping on its west side to its base on a level with the low land; its east side, about half-way down, forms a notch with some table land to the eastward. Farther eastward is the summit of a distant range, named, from its resemblance, Castle hill.*

Directions.—A sailing vessel from the northward or eastward during the north-east periodic wind (October to March) after making cape Frio, a berth should be given the coast between the cape and

* A few leagues southward of Rio is a good situation for enjoying a general view of the picturesque mountains in its vicinity. There are bold and varied outlines of the distant Organ mountains, the sharp peak of the Corcovado, and the singular heights over Tjiuca, can be seen at once.—ADMIRAL FITZROY.

Rio, as a constant and sometimes heavy swell sets in; but during the south-east periodic wind the Ilha Grande, Le Morro de Marambaya, or the Gavia are the best objects to make.* The islands at the entrance of the harbour should not be approached until the sea breeze is well set in, as a vessel may run into a calm between the sea and land winds, and be exposed to the swell and current and set west of Raza, which is to be avoided. Whilst the sea breeze is strong enough to enable vessels to overcome the ebb tide, they may safely enter by day or night.†

The land wind is often accompanied by gusts which are sometimes heavy, especially at the full and change of the moon, but they seldom extend outside the islands; and as the current is nearly always running out, if there be any doubt about reaching the anchorage a sailing vessel should keep outside Raza island, and wait for the sea breeze on the following day. If, however, a vessel be compelled to anchor, it is better to close with the eastern shore, where there is less swell.

The passage between Raza and Pay islands with depths from 6 to 10 fathoms, is the widest, and generally used. The islands are steep-to, and a vessel may pass close to them on either side. There are no dangers, nothing to avoid that is not seen, and deep water on both sides of the entrance. The north extreme of fort Villegagnon in line with fort Lage, N. by W. $\frac{7}{8}$ W., is a good mark, and leads in the best water. Vessels are required to pass within hail of fort Santa Cruz to answer any questions that may be asked; and if they have not already anticipated their arrival off the town of Rio, when passing cape Frio, they may do so by writing the name, &c. on a black board, and the news will be transmitted by the electric telegraph established at the fort, *see* p. 161. It is not necessary to shorten sail, and there is plenty of water close to the rocks. After passing the fort steer about N.N.W. for the anchorage. A steam vessel at night should bring Raza light to bear S. by W., and steer N. by E. for Santa Cruz light; pass within hail of the fort, and proceed as before.‡

* An eight-fathom bank, said to lie about S. ½ W. distant 46 miles from Raza island, should be avoided in rough weather.

† When vessels enter the harbour at night, a signal is made from fort Santa Cruz to the city, which is not to be understood as interfering with the vessels entering,

‡ "There is occasionally a very heavy sea at the entrance of the harbour, so heavy at times that I have seen large ships compelled to turn back, and one ship of 1,000 tons burthen had her decks swept in entering the harbour, and the master washed overboard and drowned."—Navigating Lieutenant J. S. Watts, H.M.S. *Narcissus*, 1865.

The water will then deepen, and the soundings will be lost for a short time with the hand lead. Villegagnon fort may be passed at the distance of 2 cables. From the outer part of the fort the 3-fathoms line of soundings is nearly in line with Rat island. Vessels should therefore keep eastward of this line. Merchant vessels arriving, are required to anchor a little below Villegagnon fort, where they are visited by the health officer.*

The passage between forts San Juan and Lage is not recommended for a sailing vessel, as the tides are irregular, and the wind may become variable under the Sugar loaf; but coasters work in on the western shore, and through this channel, against the land wind, assisted by an eddy current, found when the stream is running out, which it does for about 18 hours out of 24.

Vessels about to leave the harbour usually get in the fairway, on the evening before departure, and weigh in the morning with the land wind, which will generally carry a vessel outside the islands.

Tijucas isles are a cluster of small islets lying southward of cape Gavia at about 9 miles west of Rio. Meio, the eastern islet, lies S.E. by S. one mile from the cape; and the south-westernmost islet, which is about 200 feet high, S.W. ½ S. 1¾ miles from the cape. About half a mile southward of the latter islet, is a reef awash; and at two-thirds of a mile eastward of the islet is said to be another reef, also awash.

GUARATIBA CAPE† rises in a conical form to the height of 1,115 feet, and is the southern termination of the range of mountains that surround Rio de Janeiro. There is a rock above water close to the cape, named Ilha Palma da Guaratiba, and one mile to the eastward is Raza island, about 2 cables off shore. Half a mile westward of Raza isle is a sunken rock. From abreast Guaratiba cape, Redonda island with its steep shores intersected with white and dark green, may be clearly seen in fine weather.

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* Merchant vessels passing Villegagnon fort are liable to be fired at and fined. The price of the first gnn is 7*s.*, the second 14*s.*, the third 3*l.* The master is required to deliver to the health officer all letters and papers without exception, consignees letters and all. If any should afterwards be found on board, the vessel is fined. The harbour regulations will be given at the time of arrival by the guard officer; they are in Portuguese, French, and English. They must be returned before the vessel leaves the port.—*Nautical Magazine*, June 1853.

† *See* Admiralty chart:—Ilha Grande and Sapetiba bays, No. 2,044; scale, *m* = 0·56 of an inch.

On the west side of cape Guaratiba, there is a passage named Barra Guaratiba, three-quarters of a mile wide, having 2 fathoms water, leading into Sapetiba bay. With S.W. winds a heavy sea sets in, which renders the passage navigable only for small vessels of about 6 feet draught.

MARAMBAYA ISLAND, about 22 miles in length east and west, and from one quarter to 2½ miles in breadth, is principally formed of a bank of sand from 20 to 40 feet above the level of the sea. At the west end, a hill named the Morro de Marambaya rises to the height of 2,066 feet; it is covered with trees, and may be seen from a distance of about 30 miles. The island is more or less covered with creeping plants, brushwood, and mangrove. It is said to be steep on the south side, on which the sea breaks heavily; on the north side it is level, and abounds with shell fish and sand larks.

Banks.—From Sena point, the north-west extreme of the island, a bank having from 1½ to 3 fathoms water, extends N. by W. ½ W. nearly 3 miles, leaving a passage about three-quarters of a mile in breadth between it and Guahyba island into Sapetiba bay.

From Sena point a reef extends westward nearly one mile, and off Lucina point 2 miles to the south-westward, there is a ledge of sunken rocks. As Marambaya island is low, with the exception of the morro at the west end, it should be approached with caution in thick weather.

Marambaya rock (Eastern Lage), a bare islet 59 feet above the sea, lies 14½ miles to the westward of cape Guaratiba and about 2½ miles from the shore of Marambaya island, with 9 to 17 fathoms water all round, and 21 fathoms one mile south of it. When seen from the southward Marambaya rock has a conical appearance.*

SAPETIBA BAY covers a space of about 20 miles east and west, with an average breadth of 6 miles north and south, and is protected by the Restinga or island of Marambaya. The western part of the bay is studded with numerous islands and rocks, having deep water and good anchorage between them; the depths vary from 12 to 3 fathoms, soft muddy bottom.

At about 2½ miles north-west of the eastern end of Sapetiba bay is Pedras point, with islets and rocks close to the southward and westward. From Pedras point the shore trends north-west, and then

* The Commander of the Messageries Maritimes Co.'s S.S. *Brésil*, 1892, reports having seen the sea break heavily and almost continuously for a distance of about 2 miles eastward of Marambaya rock.

westward to a point about 2 miles distant, forming a sandy bay with the village of Destero on its eastern side. The coast then trends north-westward to Sapetiba, a distance of 1¾ miles. At 2 miles west of Sapetiba there is a rocky patch, which uncovers at low water. At 2½ miles north-west of Sapetiba point is the Barra Santa Cruz (mouth of Rio Guandù), navigable for canoes; the village and church of Santa Cruz lie near the river, 4 miles from the entrance.

From the mouth of the Rio Guandù, the shore trends north-westward for 3 miles to that of the Itaguahy, which is navigable for boats of 4 or 5 feet draught. Here sugar is shipped for Rio de Janeiro. From the mouth of the Itaguahy to about 16 miles to the westward are numerous islands and rocks. The two largest of these islands are high, and close to the main land; that to the eastward is named Madeira; but the passage between it and the main is nearly closed by a tongue of land, leaving only a narrow boat channel.

The westernmost large island, 1,115 feet high, named Tacuruzà, is nearly 3 miles in length north-east and south-west, and also lies close to the main. The next island in size is Jaguanão, 656 feet high, and lies about 2½ miles southward of the west end of Tacuruzà with several smaller islets around it. About 2¼ miles west of the south end of Jaguanão island, and 2 miles from the nearest part of the Morro of Marambaya is the Areia, a rocky shoal of about half a mile in extent.

At 3¾ miles N.W. ½ N. from Sena point, the north-west end of Marambaya, is the island of Guahyba 623 feet high, lying off the entrance of Mangaratiba bay on the north shore, with 6 to 10 fathoms close to. At about 1¾ miles W. ½ N. from the south point of Guahyba island, is Flat rock, just awash and steep-to.

Directions.—Vessels bound into Sapetiba bay should round the Morro de Marambaya at 2 miles distant in 10 to 12 fathoms water, and steer for the west peak of Guahyba island bearing North. When about half a mile from the south point of Guahyba, steer E.N.E. for the highest part of Tacuruzã island, leaving the Jaguanão group on the starboard hand and carefully avoiding the Enchadas rock, which lies half a mile W. by N. from Carapuca islet; and when Carapuca bears South, steer E. by S., between Pedra Branca and Furtada island, into Sapetiba bay.

Vessels may anchor in 5 to 7 fathoms water under the south side of Madeira island; also southward of Pedra Branca; northward of

the Jaguanão group, or westward of them; and vessels of light draught in any part of the bay.

Tides.—It is high water, full and change, at Sapetiba at 2h., springs rise 5½ feet.

Mangaratiba bay, about a mile broad at the entrance and 2 miles at the head, is about 2 miles in length, and lies northward of Guahyba island. The village and church of Mangaratiba lie on the eastern side, and small craft may anchor in 1¾ to 2¼ fathoms water. The deepest water is on the west side of the bay. Vessels proceeding into this cove should be careful to avoid the Flat rock lying 1¾ miles W. ½ N. from the south point of Guahyba island. The rock is most dangerous in hazy weather.

ILHA GRANDE BAY, in the entrance to which lies the island of the same name, is about 17 miles from north to south, and 12 miles from east to west, with an average depth of 10 fathoms. In the northern part of the bay lies Gipoia island, surrounded by clusters of smaller ones which have many outlying rocks and dangers, the outer and southern island of this group is named Coronel, and lies 2½ miles south-west of Gipoia island; it is small and has a sunken rock 4 cables to the west-north-westward. The shores of the bay are thickly studded with rocky islands with outlying sunken rocks, the most dangerous of which is Meros shoal, a patch 3 cables in diameter, lying nearly in the centre of Ilha Grande bay, 2¾ miles N.E. ¼ E. of Meros island; the depths around this shoal are from 8 to 11 fathoms, with 14 fathoms at three-quarters of a mile distant. There is also a patch of rocks half a mile north-north-westward of Meros island.

Many small streams empty themselves in Ilha Grande bay, and in its western part shoal banks extend a considerable distance from the shore.

Ilha Grande, 3,280 feet high, and covered with verdure to the water's edge, is about 16 miles in length east and west, and 6½ miles north and south. Some parts of the island have been cleared and are under cultivation, but the greater portion is a dense mass of trees and underwood. On it is a signal station to which communication may be made by the International code.

Anchorages.—On the north-east side of Ilha Grande are Palmas, Albrahao*, and Estrella bays, affording anchorage for the largest

* In 1893 a sunken wreck, with masts above water, was in 7 fathoms, on the eastern side of Albrahao bay, with Grossa point bearing E. ¼ S. 1 1/10 miles; and Meio island N.E. by N.

vessels in 6 or 7 fathoms, muddy bottom, and where water, fruit, yams, pigs, and fowls may be procured. Steam vessels short of fuel may obtain an abundance of wood in Palmas bay; the necessary permission for cutting it should be first obtained.

Sailing vessels should not anchor too close in, as the wind baffles from the high land round the bays, making it difficult to sail out. A slight swell rolls into Palma and Estrella bays, and in the latter when there is any wind landing is difficult. On the western side of Estrella bay a second harbour opens out, landlocked, completely sheltered, and an excellent place for a vessel to refit in. Albrahoa bay affords convenient anchorage with general depths of 7 fathoms, and 3 fathoms alongside the rocks; it is the quarantine station for the port of Rio de Janeiro, and has a landing pier 66 yards long, with crane and semaphore, *see* page 167.*

Vessels bound into Palmas bay with the sea breeze may pass between Palmas islet and the shore, in 7 to 10 fathoms, keeping the shore side aboard. The channel is nearly a quarter of a mile wide, with 8 fathoms water close to the outer rock of the reef, extending southward from the islet, and in using this passage a vessel will save working into the bay. From the eastward, Palmas islet shows out conspicuously against the background formed by Ilha Grande, being covered with darker verdure than the main island.

Eastern passage.—Castelhanos point, the east extreme of Ilha Grande, is separated from Marambaya island by a passage 6 miles wide, which leads into Ilha Grande bay, between the island and the main. The passage is clear, the water deep, and there is good anchorage on muddy bottom in any part of it. The land is high, and the scenery in all parts of the bay exceedingly grand. Vessels at times are liable to meet with baffling winds, the sea breeze not reaching through, particularly in the summer, when it sets in from the southward. The land wind blows from the north-east during the summer, and from the north-west in the winter.

Islets.—At one mile north-westward of Grossa point, the north-east entrance point to Albrahao bay, is Meio (Green) islet, 65 feet high, with its summit covered with green shrubs; and at 1⅓ miles east-north-east of it is Pao Pino (Tree) islet having a single tree on its summit, the base being composed of boulders of granite. Off

* "It is stated there is a good deal of fever and ague at Ilha Grande in autumn and spring, the appearance of the inhabitants went far to confirm the report."—Captain C. A. Campbell, H.M.S. *Narcissus*, 1865.

Sta. Anna village, at the northern extremity of the island, are several islets, the largest and most northern is Macacos island, half a mile from the village; and at a mile to the eastward, and about a quarter of a mile from the shore, are some islets surrounded by shoal water. One mile to the north-westward of Macacos island is the small island Tacuatiba, with a patch of 4¾ fathoms, 2 cables, to the north-eastward of it.

Sitio Forte bay, situated on the north-west side of Ilha Grande between Grossa and Aritiba point, at one mile east of it, is well sheltered, and capable of accommodating several vessels in 9 to 10 fathoms, blue clay.

Supplies.—Fresh water, fruit, and fish can be easily obtained in Sitio Forte bay, but other kinds of provisions must be previously ordered.

Olga shoal, consisting of sand and shells, with several rocky pinnacles with one to 5 fathoms on them, is about half a cable in extent, and lies in the bay eastward of Sitio Forte, with Banana point bearing N.N.E. ¾ E., about half a mile. There are depths of 8 to 13 fathoms close around the shoal.

Islets.—Rocks.—The shore of Ilha Grande between Sitio Forte bay and Acaya point, the west extreme of the island, is bold and clear of danger. Branca island or the western Lagé, a flat white rock, lies 9 cables north of Arcatiba point on the north-west side of the island. To the southward of Acaya point are two sunken rocks, with 3¾ and 4½ fathoms, lying respectively S. by W. ¼ W. nearly one mile, and S.W. by S. ¼ S. 1⅓ miles from the same point. These rocks have from 16 to 19 fathoms round them, and there is said to be a safe passage between them and Acaya point.

Rios bay.—At about 5½ miles westward of Castelhanos point, on the south side of the island, is the bay and village of Rios. There are two islets in the bay with anchorage inside them for small craft. About 2 miles southward of Rios is Jorge Griego island, said to be steep-to, with a bay on its north-west side affording anchorage. A heavy swell sets towards the island.

Tides.—It is high water, full and change, off Estrella bay at 0h. 30m.; springs rise 5 feet, and neaps 4 feet; and at Parati 1h. 43m., springs rise 5½ feet. There is little or no stream.

The COAST.—At about 9½ miles W.S.W. from Drago point, the south-west extreme of Ilha Grande, is Joatinga point, the south-west entrance point of Ilha Grande bay. The point is high, and may be approached at a prudent distance. At 7 miles to the south-west of Joatinga point is that of Cairoçu, also high, the coast between forming a bay. From Cairoçu point the shore trends to the north-west and westward, forming a bay nearly 2 miles deep, between Cairoçu and Trinidad points; thence from Trinidad nearly west for 7 miles, then north-west into Batumirim bay, where there is anchorage in 2½ to 4½ fathoms, and off which are several islets and rocks, all above water. At 13½ miles westward of Cairoçu point and 3 miles from the shore is Cove islet, and 2½ miles farther westward is another islet. About 11 miles westward of Cairoçu point and at 2½ miles inland is the peak of Parati.

UBATUBA BAY.*—About 24 miles to the westward of Cairoçu point is Grossa point, which, stretching out about 2 miles from the land as a peninsula, forms Ubatuba bay to the northward of it. A sunken rock lies half a mile northward of Grossa point.

Anchorage.—There is anchorage for small vessels in 3½ fathoms, 1¼ miles eastward of the town of Ubatuba. The road is exposed to the swell from seaward. Fresh provisions are scarce.

GREAT PORCOS ISLAND, situated 4½ miles southward of Grossa point, is moderately high, about 2½ miles in length and 1½ miles in breadth. Off its south point is an islet with a passage between for boats; and two other islets lie off its south-east and north-east sides at the distance of one mile, with 6 to 15 fathoms between. The two latter islets are wooded, and 2 miles distant north and south of each other, with 6 to 11 fathoms water between them.

Anchorage.—On the north side of Great Porcos island is Palmas bay with a village at its head, nearly a mile in breadth and about three-quarters of a mile deep, where vessels may anchor in 3¾ to 4 fathoms, muddy bottom. The bay is sheltered from all winds except those from N.E. to E. by N., which seldom continue long enough to cause a heavy sea, and is an excellent place for a vessel to refit.

Directions.—In running for Palmas bay, strangers will find the island a little difficult to make out owing to the high land northward

* See Admiralty plan :—Ubataba and adjacent anchorages, No. 542; scale, m = 1·1 inches.

of it, but as the water is deep close to, there is no danger in standing on until the white house on the north-east end of the island is seen; passing inside, between, or to the northward of the islets. The tide here, affected by the prevailing winds, rise about 3 feet.

Supplies.—Water is plentiful and easily obtained from the south-east part of the bay. There are several small villages on the mainland where fresh beef and stock may occasionally be obtained.

FLAMINGO BAY.—The north-west point of Great Porcos island forms with a point projecting from the mainland, a narrow channel rather more than a quarter of a mile in breadth, carrying 16 fathoms water, through which vessels can pass when the wind is steady by not keeping too close to either point, into Flamingo bay. This bay is about 2 miles deep, more than 1½ miles in breadth, and affords good anchorage in 2 to 5 fathoms water, southerly winds bring in a heavy swell.

There is anchorage for small vessels, soft bottom, on the southern side of a cove at the north-west part of the bay. The village of Flamingo stands in a small bight on the west side of the bay. Westward of Flamingo bay are Fortaleza and Mar Virado bays.

COAST.—From Flamingo bay the coast trends to the south-west for about 20 miles to Arpour point, westward of the north-west point of St. Sebastiaõ. The shore has several indentations, backed by high land, and with the north side of St. Sebastiaõ island forms a deep bay open to the eastward, named Barra das Canaveiras.

VITTORIA ISLAND.—At nearly 4 miles eastward of the north-east end of St. Sebastiaõ island is that of Vittoria, 2¼ miles east and west and one mile in breadth. Southward of the west end of Vittoria are two small islets surrounded by a reef which extends about 2 miles S.S.W. from the island.

The Busios islets lie S. ¾ E. 11 miles from Porcos island, and north-eastward 6 miles from Vittoria. The passage between these islands and the shore, guarding against the reef southward of Vittoria, is free from danger. There is a depth of 17 fathoms, at 25 yards from the Busios.

ST. SEBASTIAÕ ISLAND, in lat. 23° 55′ S., long. 45° 12′ W., is about 14 miles in extent, and its summit, 4,265 feet high, is as high as the mountains of the mainland, from which it is separated by a

channel from about one to 3 miles wide. The island, which may be seen in clear weather from a distance of 45 miles, is covered with wood nearly to its summit, and its shores are steep-to; it has several waterfalls and some scattered houses, which have a pleasing effect. The eastern side of the island extends nearly north and south (with Sombrio bay between),* and from the south-east point the southern side trends about W. by N.

Bank.—About 2½ miles north-eastward of Canaveiras point, H.M.S. *Forward* found depths of 5 and 5½ fathoms, for the distance of one mile.

Villa Nova da Princeza, off which is the usual anchorage, stands on the western side of the island, at 3½ miles from Canaveiras, the north point. The town consists of a couple of streets and a few detached houses, with a church built on the rising ground at the back of it; a dilapidated fort stands near the beach. The old town of St. Sebastiaõ is on the mainland at 2½ miles to the south-west of Princeza.†

Telegraph.—There is telegraphic communication with Santos and Rio de Janeiro.

St. Sebastiaõ Channel.—The channel of St. Sebastiaõ affords a roomy and safe anchorage for the largest vessels, and there is almost always smooth water in it. It runs to the southward along the island side for about 5 miles, when it trends to the south-west. The western side of the channel or that of the mainland is bordered by a bank, having over it from one to 3 fathoms water. From Arpour point, the north-western entrance point of the channel, the bank extends about 2 miles towards San Sebastiao, leaving a channel one mile wide, with a depth of about 12 fathoms. The bank terminates at one mile southward of the town of St. Sebastiaõ.

Vessels bound into St. Sebastiaõ channel from the northward, when at half a mile westward of the Armaçaõ village at the north part of the island, should steer S. by W. ¾ W. along the island side at a distance of about half a mile, in from 10 to 20 fathoms. Off Villa Nova da Princeza the depths are 13 and 14 fathoms, gray sand. The southern channel may also be used if convenient, so that a vessel may leave by either channel according to the wind. The winds at

* *See* Admiralty plan:—Sombrio bay on sheet, No. 542; scale, *m* = 1·1 inches.

† *See* Admiralty plan:—Channel and anchorage of San Sebastiaõ island, No. 543; scale, *m* = 1·0 inch.

St. Sebastiaõ during the day blow nearly always from N.N.E. or S.S.W., following the direction of the channel, but frequently interrupted by calms. At night the land wind is variable.

Supplies.—There are several watering places at St. Sebastiaõ; one of the best is between Villa Nova da Princeza and the Armaçaõ at the north end of the island; the water is good and easily obtained. Cattle, poultry, spirits, and fruit may be procured at a moderate price. On all the coast of the mainland fire-wood is abundant. Fishing is seldom productive, but the fish are of a good quality.

Tides.—It is high water, full, and change, at St. Sebastiaõ at 2h.; springs rise 4 feet. The tides are irregular. The current follows the direction of the winds, and within the channel runs nearly one mile an hour, and occasionally 2 miles an hour.

The COAST.—From the southern entrance of St. Sebastiaõ channel the coast formed by the high land trends in a westerly and southerly direction, about 50 miles to Moella islet, near the east side of entrance to Santos bay. In the bay thus formed at 17½ miles from Sebastiaõ point, the west extreme of that island, and 5¾ miles from the shore, is Monton de Trigo or Corn Stack island, 984 feet high, nearly conical and wooded to the summit. At 2 or 3 miles around it, and at the same distance from the coast, the depths are from 10 to 16 fathoms, muddy bottom.

ALCATRASSES ISLANDS, situated 15 miles S. by E. ¾ E. from Monton de Trigo, is a barren group, the largest of which, 879 feet high, may be seen from a distance of 30 miles. At 2 miles north-westward of the largest islet is Paredon islet, and at the same distance to the north-east are two or three others. These latter islets are low. A patch of 5¼ fathoms lie about 3 miles south-west of the large islet. It is not prudent to approach this group nearer than 4 or 5 miles, as the bottom in the vicinity is stated to be foul and the currents uncertain.

SANTOS HARBOUR* is formed on the east by the island of St. Amaro, which is separated from the main by the small river Bertioga, navigable for boats; and on the west by Santos island. The entrance to the Bertioga is northward of St. Amaro, and named Barra de Bertioga. Manduba point, the south end of St. Amaro

* *See* Admiralty plan:—Santos harbour, No. 19, scale, *m* = 2·3 inches.

island, forms with Taypu point, at nearly 7 miles west of it, the extremes of Santos bay. The bay is about 3½ miles deep, has depths from 4 to 8 fathoms, and on the east side is the principal entrance to the harbour, off which vessels may lie sheltered from all winds except those from south-westward.

The shore ends of the two submarine cables are landed in the bay.

The bay of Santos is easily known; Taypu point being the westernmost high coast land for some distance, the coast immediately west of it being low and flat to the base of the mountains for about 10 miles inland; while all Santos bay is surrounded by a succession of steep hills of moderate height, broken here and there, chiefly at the north side of the bay, into small low beaches.

SANTOS.—The town of Santos stands on the west and south sides of the harbour, on the north-east corner of the island of Santos or Engua Guaçu, and is the principal seaport of the coffee-growing province of San Paulo. It is well built, has two churches, convents, hospitals, and building slips, with a population (1891) of abou 2,000,000. Its situation is unhealthy, the country around is low, woody, and frequently deluged with rain. There is a railway between Santos and San Paulo distant about 37 miles, and to Rio de Janeiro; also a steamer to Rio, every 5 days.

Santos is in telegraphic communication with Rio both overland and submarine, and there is also a cable to Monte Video.

The entrance to the harbour is commanded by a fort on the south side named Barra Grande, a large white building, the harbour extends north-eastward about a mile, thence in a northerly direction for 4 miles to the anchorage off the town. The harbour is narrow, with 4 to 11 fathoms water. On the eastern shore, close up to the town, is a small fort (hidden by the trees), on Itapema point, off which the depth is 12 fathoms.

Rock.—About 1¼ miles south of the town lies a rock with a depth of 16 feet, and 4¾ to 6½ fathoms between it and the shore. From this rock Outeirinhos south bluff (131 feet high) bears S.W. by S. distant 72 yards. A red buoy marks the position of the rock.

Buoys.—Two red buoys with staff and ball, mark the entrance to Santos harbour, namely, one on the south side, 3 cables W. by N. from fort Barra, and one on the north side marking the edge of the bank westward of point Trinxheira. These buoys are liable to shift during south-westerly gales, and are therefore not to be depended on.

LIGHT.—On Moella (Gizzard) islet, a mile south-east of Manduba point, is a white tower, 40 feet high, which exhibits at the height of 334 feet above high water, a *fixed* white light, which may be seen in clear weather from a distance of 24 miles. It is reported that the light can only be seen from 12 to 14 miles.

A small light is said to be shown from fort Barra Grande, on the south side of entrance to Santos harbour.

Anchorage.—Large vessels can now lie alongside the wharves at Santos; and there is good anchorage off it in 3 to 5 fathoms. Vessels of war usually anchor more to the eastward, the sea breeze being stronger there. A mud-bank facing the northern shore between Itapema point and fort Ilha de Carvalho to the north-westward, considerably narrows the channel and anchorage.

Commerce.—The bulk of the import trade of San Paulo enters through the port of Santos, but a considerable quantity, principally cotton and woollen fabrics, is introduced through the port of Rio de Janeiro, and overland by rail, in consequence of the difficulties, delays, and expenses merchants incur in the over-blocked harbour of Santos. The combined value of the imports and exports through the port of Santos (1889) is over 14,000,000*l.*, and the number of vessels that entered and cleared during that year amounted to 1,090, with an aggregate of 1,187,445 tons.

Supplies.—At Santos all necessary supplies may be procured in abundance. Water is purchased, or boats may be sent 5 or 6 miles up the river for it, where there is a deep clear pool of fresh water. For washing purposes, it may be obtained from hydrants close to the shore.

Coal.—The San Paulo Railway Company will generally supply a ship-of-war with a small quantity of coal. There is usually about 200 tons in stock.

Pilots.—Vessels requiring pilots can obtain them from the village of Barra by making the usual signal.

Tides.—It is high water, full and change, at 2h. 50m., springs rise 5 feet. The tides are strong, particularly the ebb.

Directions.—After passing Moella islet about one mile distant, steer along the land until mount Serat bears N. ½ E., when it may be steered for until the river entrance is well open bearing E. ½ S. Steer

for the entrance on this bearing passing close to the fort on south side; when the southern and eastern shore should be kept aboard until the inner of the two trees on the summit of north Outeirinhos is in line with the perpendicular rock on the face of south Outeirinhos bearing N.W. ¼ N.; this mark will lead in the deepest water in this reach. When near to south Outeirinhos, edge quickly to mid-channel to avoid the rock off it, and having passed the north Outeirinhos, steer with Itapema point a little on the starboard bow, pass moderately close, and then haul to north-westward to the anchorage off the town, in about 4¾ fathoms, with mount Serat bearing S.W. by W.*

LAGE de SANTOS, situated 16 miles S. by E. ¼ E. from Moella lighthouse, is a barren white islet 70 feet high; and E.S.E. of it, about 1½ miles, is a reef of rocks about 10 feet high; also on the western side of the Lage at three-quarters of a mile distant, there is a rocky shoal separated from it by a deep passage. Between it and Santos the depths are from 15 to 22 fathoms, sand, mud, and broken shells.†

The COAST from Taypu point, the west extreme of Santos bay, trends in a south-westerly direction 22 miles to the village of Conceiçaõ. The shore is generally low, backed by high mountains at the distance of 12 or 15 miles inland, which here and there branches towards the sea, and appear from a distance like islands. At the distance of 12 miles S.S.W. from Taypu point, is a small bank with only 9 feet water on it, lying in the way of vessels from the southward bound into Santos. It was discovered by the Brazilian steam vessel of war *Don Pedro Seconda*, and seen to break, by the master of S.S. *Plato* in 1884. Conceiçaõ stands on rising ground near the beach; thence a low sandy shore continues to the south-west for 14 miles to the heights and creek of Piruibe, where it takes a more southerly turn for about 5 miles to Guaraha point and islets.

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* H.M.S. *Volage*, 1879.

† MEDEIROS ROCK, originally reported as awash in 1811, in lat. 25° 41′ S., long. 44° 48′ W. (south-eastward of Santos), and said to have been sighted about 10 miles westward of this position in 1877, was again reported in 1880, as having 6 or 8 feet on it, in lat. 25° 26′ S., long. 44° 21′ W., or about 29 miles north-eastward of the original position. H.M.S. *Beacon* examined the first position, in 1877; and H.M.S. *Wrangler*, *Amethyst*, and *Algerine*, in 1885. As the existence of the danger is considered extremely doubtful, it is not placed on the Admiralty charts, but caution should be exercised when in this vicinity.

From Guaraha point the shore trends again to the south-west, and at the distance of 11 miles is Jurea point, with the bar of the river Una between. At 14 miles more to the south-west is the bar of the river Iguape; and about 4 miles farther on is Capara bar, the entrance to the Mar Pequeña de Iguape, which admits boats into that sea. Temporary anchorage will be found at any convenient distance from the shore.

LAGE de CONCEIÇAÕ, situated 7 miles S.E. by E. from the village of Conceiçaõ, and 15 miles northward of Queimada Grande, is a small rock about 12 yards in extent and 16 feet above the sea, with 12 fathoms, mud and sand, at three-quarters of a mile seaward of it. At 6½ miles S.W. by W. ¼ W. from the Lage de Conceiçaõ is a rock about 40 or 50 yards in extent with 26 feet over it; the sea breaks on this rock during fresh winds from seaward.

The QUEIMADA ISLETS lie north-west and south-east 9 miles from each other. Queimada Pequeña, about 9 miles from the coast, and 10 miles S.W. ½ S. from the Lage of Conceiçaõ, is a small conical islet, thickly wooded, and visible at a distance of 20 miles. Queimada Grande, 623 feet high, is said to be nearly 2 miles in length, north and south, with a reef extending from its northern end, and is visible from 30 to 35 miles. The islet is nearly barren, with its highest part to the south-west appearing round. From the southward and eastward it shows as two peaks of nearly equal height, and is a good mark for making Santos.

MAR PEQUEÑA (little sea) is a narrow lake or channel running parallel with the shore, from 4 miles southward of Iguape bar to Cananea bay, a distance of about 30 miles. The town of Iguape stands on the west bank at 4 miles from the entrance; the sea is divided at its south-west part by the Cananea island, and it has depths of 4 to 6 fathoms. La Praya, or beach of Iguape, the island which forms the Mar Pequeña, is a chain of low sandy downs, interspersed with brushwood, and can be seen only from a short distance. It should therefore be approached with caution, and in foggy weather not nearer than 6 miles, where there is from 9 to 11 fathoms, sandy bottom.

CANANEA BAY, at the southern entrance to the Mar Pequeña, is formed by an island southward of La Praya, the sandy island fronting Iguape, and which is separated from the main to the westward by a rivulet named Ararupira.

The islet Bom Abrigo, which lies at the entrance, is high, covered with trees, and its two extremes are more elevated than the centre; there are several shoals on which the sea breaks northward of it, at the entrance to Cananea bay, and a smaller islet lies on its south side. At 2 miles eastward are depths of 11 and 12 fathoms, sand. A town, where vessels are built, stands about 7 miles north-westward of Bom Abrigo.

LIGHT.—On the southern part of Bom Abrigo islet stands a white lighthouse 40 feet high, from which, at an elevation of 504 feet above the sea, is exhibited a *flashing* light, showing alternately *two white flashes* and *one red flash*, with intervals of *fifteen* seconds between each flash. The light should be visible in clear weather from a distance of 14 miles.

Anchorage.—The bay is large and affords well sheltered anchorage. The entrance will be known by mount Cardoz, 2,657 feet high, the highest part of the island forming Cananea bay; notwithstanding its height, the fogs that prevail on this part of the coast during the southern monsoon prevent the land being seen. H.M.S. *Mallard* crossed Cananea river bar a little before high water, in 1879, and found the least depth to be 15 feet; the shoal part of the bar was about a quarter of a mile across, when the water deepened to 7 and 12 fathoms. The town of Cananea is 6 miles distant, and port Colonia, visited by the *Mallard*, is about 12 or 14 miles from the anchorage off Bom Abrigo.

Competent pilots, which are necessary for crossing the bar, can only be obtained at Cananea.

There is a well protected anchorage westward of Bom Abrigo island in 4 fathoms, sand, about 3 cables from the island shore. The best entrance to this anchorage is southward of Bom Abrigo, the south extreme of which may be rounded in 7 fathoms water at a distance of 2 cables. This is the best place to wait for a pilot, if bound to Cananea bay. The northern channel is generally used, but the southern is the deeper.

The COAST from Cananea point on the south side of entrance to Cananea bay, continues low and sandy to the south-west for about 30 miles, to the entrance of Paranagua bay. A small islet and reef lie off Cananea point. At about 8 miles S.S.W. from the point and nearly opposite the bar of Ararupira, is Castilho islet, 32 feet above the sea. The islet takes its name from a ridge rising from the centre,

which, at a distance, resembles a castle. At 7 miles S.W. by S. from Castilho is Figueira islet, 160 feet high. Both these islets are nearly barren. They may be rounded closely, and at one mile seaward there are from 10 to 15 fathoms, fine sand.

The water which issues from the bay of Paranagua carries with it alluvial deposits which diminish considerably the depths outside, but not so much as to affect navigation. At 6 miles from the entrance the depths are from 5 to 8 fathoms, gray sand and mud.

PARANAGUA BAY* extends in a westerly and northerly direction 15 miles. It is surrounded by forests, and receives the waters of many small rivers. The entrance is sheltered and divided into two channels by Ilha do Mel (honey), a low island on which are several hummocks appearing at a distance of 7 or 8 miles like islets.

Islets.—Banks.—Between Ilha do Mel and north point of entrance, there are three islets covered with palm trees, named Palmas, about 130 feet high, with several rocks one mile west north-westward. Connected with Palmas islets is a triangular-shaped bank, named Barra de Paranagua, which extends from the islets 3¾ miles seaward; its south extreme is usually marked by a buoy.

A reef is reported to lie about a quarter of a mile northward of Conxas point, Ilha do Mel, with deeper water between it and the shore.

At the distance of 6 cables E. ¼ N. from the fort on Ilha do Mel, and N.W. by W. ¼ W. 8 cables from Palmas islets, is a circular patch of rocks about 2 cables in diameter named Balcas, some of which cover at high water. A spit has extended 2 cables in a north-west direction from Balcas rocks, and has not more than 16 feet over it.

At 4 cables N. ½ W. from Balcas is Coxoes, a small island surrounded by a reef.

A rock with a depth of 7 feet over it, lies 2 cables E.S.E. of Ilha do Mel fort; and about one cable southward of an islet, 6 feet high, situated one cable off the fort.

The island of Raza da Cotinga, about 3¼ miles in length east and west, and one mile in breadth, with Cotinga island running parallel on its north-western part, lies on the south of Paranagua bay, at about half a mile from the main, and leaving a space between them and Ilha do Mel of about 1¼ miles.

* *See* Admiralty plan:—Paranagua bay, No. 231; scale, *m* = 0 75 of an inch.

Buoys.—A buoy with flag marks the reef lying about 4 cables E.N.E. of Ilha do Mel fort.

A black buoy marks the entrance to North channel with Bixo point in line with the summit of Cobras island W. ¾ N., and Figueira island N.E. ¼ N. The N.E. buoy of Paranagua bank is white, with 30 feet water close to it, and it should be left on the port hand when entering. A perch surmounted by a ball is situated 2½ miles N.E. ¾ N. from the pilot flag-staff.

A red buoy with a vane marks the S.W. extreme of Paranagua bank.

A red buoy lies a quarter of a mile N.N.W. ¾ W. of Balcas (Panema) rock.

A reef, awash at low water, lying 3 cables south-east of Caxoes island, is marked by a stake beacon.

Channels.—On either side of Barra de Paranagua there is a channel into the bay; the north channel between Barra de Paranagua and Barra Superaguy, at about three-quarters of a mile north of it, has a depth near the entrance of 16 feet at low water; there is generally a heavy swell in it and at times the sea breaks.

The south channel, half a mile wide, is the only one used. It is formed between the south-west side of Barra de Paranagua and a bank extending south-east of Ilha do Mel; the depths in it are from 8 to 3 fathoms. The bar which was stated to be shoaling in 1871, had in 1889 a depth of 23 feet at high water.

Galheta islet lies in the entrance westward of Ilha do Mel, and the channel being dry at low water is not navigable.

Town.—The town of Paranagua, which is of some importance, stands on the mainland southward of the west end of Cotinga island, and on the west side of a small creek which has from 6 to 12 feet water. It has a criminal court, a custom house, an hospital, and a population of 8,000.

Shoals.—A perch marks the northernmost of two shoals off Cruz point, the west extreme of Cotinga island; these shoals cover at one-third flood. Three red buoys mark the west side of the channel between Texeira island and Clemente point, entrance to Antonina bay. The two patches hitherto charted 2 cables northward of Texeira island are stated to be situated the same distance W.S.W. of the north point of that island.

LIGHTS.—On Conxas point, the east point of Ilha do Mel, stands a white iron lighthouse 69 feet high, which exhibits, at an elevation of 262 feet above the sea, a *fixed* white light, visible in clear weather from a distance of 15 miles. There is a pilots' flagstaff at the lighthouse.

From the fort north-westward of Conxas point, is exhibited at an elevation of 49 feet above the sea a *fixed red* light, visible between the bearings of N.W. ¾ N., through west and south, to S.S.E. ½ E., and in clear weather should be seen from a distance of 6 miles.

Porto Pedro.—The village of Porto Pedro, situated on the shore at about one mile westward of the town of Paranagua, is the principal station for the railway goods traffic between Paranagua and Curitiba. There are two wooden piers for vessels to lie alongside; the western has 13 feet water at its head, and a crane for unloading.

Coal.—The railway company have a coal depôt at Port Pedro. The price in 1889 was 45 francs per ton.

Signal station.—There is a signal station on the hill near the centre of Cotinga island, about 1½ miles eastward of Paranagua town.

Anchorage.—Merchant vessels anchor near the town of Paranagua in a creek which admits vessels of 500 tons. A mud flat extends from the main across the creek, leaving only a narrow channel which is marked by beacons. Small craft get close up to the town.

Pilots are to be obtained at Conxas point.

Supplies.—There is a good and well-supplied market; meat, fish, and vegetables can be procured at reasonable prices.

Tides.—It is high water, full and change, at Paranagua at about 3h.; springs rise 6½ feet. The tides are influenced by the prevailing winds and are very irregular; in the entrance the ebb runs at the rate of 2½ to 3 miles an hour; the flood tide does not exceed one mile an hour.

Directions.—Approaching Paranagua bay from the eastward, when 30 miles distant, three peaks, not far apart from each other, will be sighted nearly ahead; and on a nearer approach the round islet of Figueira will be seen, also the hillocks on Ilha do Mel and Palmas islets, surmounted by trees. Shoal water extends from

4 to 5 miles off the entrance. The leading mark over the bar of the north channel (January 1889), and into the river northward of Caxoes islet, is the summit of Cobras islet, in line with Bixo point; the least depth, 23 feet at high water. Vessels bound into the south channel should not shoal to less than 6½ fathoms until the lighthouse on Conxas point bears N.W. This course will lead up to the red buoy near the south corner of Barra de Paranagua.

With south-east winds, the entrance presents a continuous line of breakers, and the pilots seldom board until the vessel arrives within the bar; attention, however, should be paid to the signals which will be made from the pilot boat, as she will indicate the proper track by inclining a flag either to one side or the other.

Pass close to the southward of the red buoy on the south end of Barra de Paranagua; thence a course N.N.W. ¼ W. will lead across the bar in 23 feet at high water; passing about one-third of a mile north-eastward of Conxas point, in 8 fathoms, thence from Conxas point to the fort on the east side of Ilha do Mel. After passing Conxas point (avoiding the shoal reported to lie northward of the point), pass about 3 to 4 cables from the fort, between the fort islet, which has 10 fathoms close to, and Balcas rocks partly covered at high water. After passing fort islet keep about 4 cables distant from Ilha do Mel; when abreast the west point of this island, steer for the north part of Cotinga island, passing about 3 to 4 cables north of it.

Caution.—It is not advisable to attempt either of these channels without local knowledge, as the buoys cannot be depended on.

The COAST.—At about 23 miles south-westward of Ilha do Mel lies the entrance to Guaratuba bay. The coast between is stated to be bordered by a bank extending 4 or 5 miles seaward, over which boats only can pass. At about 10 miles southward of Ilha do Mel, and 6½ from the shore, are the three Cural islets, the largest of which is 64 feet high; and at 5 miles more to the southward are the three Itacolomi islets, 21 feet high, and nearly off Guaratuba bar. At from one to 2 miles eastward the depths are 9 to 11 fathoms, sand and mud.

At 18 miles south from Guaratuba bar is cape João Diaz, the north extreme of São Francisco island, high, bold, and easily known, and which forms the southern point of entrance to the river of the same name; the shore between is flat and the surrounding country of

little elevation, but distinguished by some remarkable hills; morro Marumby in the Serra da Prata range being 4,691 feet high, and at some miles in the interior by the Serras de Maratuba, a chain of high rugged mountains.

At 2 miles eastward of Cape João Diaz are the Graças islets, the largest of which, Ilha do Paz, is 223 feet above the sea, and at three-quarters of a mile north-east from the cape is a sunken rock with 15 feet water over it. These islets and rocks extend north and south over a space of 2 miles, with 4 to 7 fathoms water between them and the coast. The northernmost islet is on the parallel of cape João Diaz.

Guaratuba bay, in lat. 25° 51′ S., long. 48° 35′ W., is about 7 miles in length, east and west, by 3 in width, and is accessible for vessels of 8 feet draught. Several small rivers fall into the bay. The village of Guaratuba is about 2 miles within the south point of the entrance. The vicinity has been noted for its fisheries.

The RIVER SAÕ FRANCISCO DO SUL* rises in the Serra Geral or great chain of mountains about 42 miles in the interior, is augmented by various tributaries, and falls into the sea by two mouths formed by the island of the same name. The Aracary or southern channel with one fathom water, is dangerous, being obstructed by a shifting sand bank over which the sea breaks with violence.

The northern channel, more than a mile in breadth, named Bobitanga or Saõ Francisco, is navigable for moderate size vessels. The bar has from 16 to 20 feet water on it, the shallowest part being towards its south end, and extends from about one mile eastward of cape João Diaz, in a northerly direction for more than 2 miles across the mouth of the river, leaving a channel between its north end and the bank bordering the shore, with 22 feet water.

Three-quarters of a mile north-east of cape João Diaz, there is a sunken rock with 16 feet water on it.

The island of Saõ Francisco is about 18 miles in length in a north and south direction, and about 10 miles in breadth; it is generally flat, and watered by numerous streams. Cape João Diaz, the north point of the island, is 469 feet above the sea.

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* *See* Admiralty plans:—River Saõ Francisco (Do Sul) and harbour, No. 550; cals, *m* = various.

The morro Itamirim, 558 feet high, is 1½ miles south of cape João Diaz, and is the highest land on this part of the coast north of Itapacoroya point.

LIGHT.—From an iron lighthouse painted white, erected on cape João Diaz, east side of entrance to the river, is exhibited at an elevation of 309 feet above the sea, a *fixed* white light, visible between the bearings of N.W., through south, and N.E., from a distance of 12 miles in clear weather.

TOWN.—The town of Saõ Francisco (Nossa Senhora da Graça) stands on the north-west side of the island about 8 miles from the bar. It is entirely without fortifications. On the banks of the river Saguasu about 12 miles from the town of Saõ Francisco, is Colonia, a thriving German settlement numbering about 7,000 people; their principal trade is in wood, which they send to Monte Video and Buenos Aires.

Buoys.—A red buoy marks the outer edge of the shoal extending from Galhinas point, with that point bearing E. ¾ N. distant 7 cables.

A black buoy marks the shoal 9½ cables N. ½ E. from Cross point; and a red buoy the shoal between 4 and 5 cables N.E. from Cross point.

A red buoy with ball is moored in 10 feet on the northern edge of Valois shoal, with the church bearing S. 32° E., nearly 4 cables.

A red buoy with ball, in 26 feet, lies on the western side of a 10 feet bank, with the church E. ½ S. distant 2 cables.

A similar buoy lies in 3½ feet, with the church N.E. by E. nearly 6 cables.

Caution.—Too much reliance must not be placed upon the buoys.

Beacons.—Red beacons mark the banks dry at low water, situated, respectively, W. ¼ N. one mile; W. ½ N. 4⅓ cables; W. by S. ¼ S. 4½ cables from the church; also the one-fathom bank S.W. by W. ¼ W. 3½ cables from the church.

Shoals.—A shoal with a depth of 12 feet is reported to lie S. 52° W. distant 2 cables from Cross point, but this position is doubtful.

A shoal with 3½ fathoms and 4 to 5 fathoms close around, lies with Cross point bearing E.S.E. and Pedras point S.E. by S.

Anchorage.—The best anchorage for large vessels is in 9 fathoms, with Pedras point E. by N. ¼ N., and the church S.E. by E. Smaller vessels may approach the shore to 5 fathoms, with Pedras point N.E. and the church S.E. by E.

Tides.—It is high water, full and change, at Saõ Francisco at 2h. 30m. a.m.; springs rise 7 feet, and neaps 5 feet. At springs, the stream from the river runs from 3 to 4 miles an hour, and is only overcome by the strength of the flood, soon after resuming its course; this is called half tides (meias marés). The north and north-west winds cause the water to fall, and those from the south and south-east raise it, in proportion to the force of the wind, from 6 to 9 feet above the main level, which inundates the two banks at the entrance to the river.

The land winds blow from S.W. to W.S.W. from March to September, and during the remainder of the year from W.N.W. to N.W. The winds from N.E., S.W., and West raise a sea, but it goes down as the wind dies away.

Directions.—The river Saõ Francisco should be entered with caution, and the sea on the bar should be taken into consideration. When the wind and tide are contrary, the sea is heavy even in fine weather, and inside the bar, in from 8 to 12 fathoms water, it is generally worse. It is therefore always prudent, before entering the river, when it is contrary to the wind, to wait for change of tide so as to have smooth water.

Steer in with cape João Diaz bearing about S. by W., keep the lead going, and when at the distance of 3 miles from the cape, steer West to bring its east extreme in line with the morro da Enciada, the eastern point of the island, bearing S.S.E.; then steer for it, which leads in the best water (21 feet), until a long mile from the cape, or the river is well open; but the north point of entrance should not be brought westward of S.W. by W. ¾ W. until well inside the cape, in order to avoid the shoal water extending-three quarters of a mile northward of the cape. Then keep in mid-channel and the water will gradually deepen to 8 and 11 fathoms; and a vessel will carry the latter depth past a shoal extending seaward from the north point of entrance, and on which the sea breaks heavily.

A vessel of light draught may cross the bar, giving cape João Diaz a berth of half a mile.

After passing the north point and breakers at a convenient distance, a group of islets will be visible. Steer along the north-west shore with the islets ahead until the town of Saõ Francisco is seen; then steer toward and anchor off it as previously directed.

Vessels working, should avoid the detached rock 4 cables north-east of Ovaringa islet, and about one-third of a mile from the north shore, and tack immediately the lead indicates hard bottom. On the south-east side of the channel is Corõa Grande flat, fronting the mouth of the Sacco de Peroba, and which dries at low water. During the sea breeze there is a heavy surf on it, and the stream out of the river sets towards it; in working, the north shore should be kept aboard.

Outer anchorage.—A stranger desirous of communicating with the town of Saõ Francisco, and not wishing to cross the bar, will find anchorage with good holding ground between Saõ Francisco and the Graça islets, well sheltered from all winds but those from the north. The wind seldom blows hard from the northward; but a gale often occurs from S.S.W. or South and veers to S.E. A vessel at anchor near the entrance to Saõ Francisco river would be on a lee shore in a south-east gale, and from the trend of the land unable to obtain an offing; hence the value of this anchorage.

From the northward, pass a quarter of a mile inside the northern islets, and steer towards the morro Itamirim, with the other islets broad on the port bow until about half way through; then anchor in 5 or 6 fathoms, sand, or if convenient more to the northward. From the southward, pass between the south islet of the Graça group, lying just northward of the morro da Enciada, and the islet of Paz, the largest of the group next it. The channel is about a mile in breadth, with 10 fathoms water, shoaling to 5 or 6 fathoms as a vessel advances to the northward.

Pilots.—Vessels anchor in the outer anchorage to await a favourable opportunity to enter the river; and here a pilot may be obtained.

The COAST.—At 12 miles south of the Graça islets is another group, named the Tamboretes, at about 2 miles from the shore. At 5 miles S.S.W. of the latter islets are the Remedios islets, lying east of the entrance to the Aracary or southern channel of Saõ Francisco. and between 2 and 3 miles to the southward of them are Lobos and

Tapilinga islets. All these islets are covered with trees. From the Aracary channel, the low shore trends in a southerly direction for 18 miles, thence eastward for about 4 miles to Jurubatuba point. About 8 miles southward of the Aracary is Itapucu bar, and 6 miles beyond is Itacolomi (Pedras) island, 109 feet high, and 3½ miles from the shore.

The land between Itapacaroya point and Santa Catharina island is high, covered with wood, and like that in the neighbourhood of that island appears in irregular mountains and valleys, some of which extend to the coast, and can be seen at a distance of 45 miles. The shore forms several bays, with small rivers running into them. Tijucas bay, north-west of Santa Catharina, affords good anchorage.

Volage bank, of 14 fathoms, is situated about 25 miles eastward of Itapacoroya bay. Its centre is in about lat. 26° 44′ S., long. 48° 7′ W.

ITAPACOROYA BAY*, to the westward of Jurubatuba point, is a safe anchorage, with winds from S.E. round by south to N.W., in about 5 fathoms, mud, and good holding ground. Small vessels lie sheltered close in to the village, near some piles formerly a pier, when this was a great Armaçao, or whaling station. A disagreeable sea sets into the bay with north-east winds. The head of the bay is shallow, and from the village, along the beach towards Feya islet, are several reefs which do not show with smooth water. Anchorage will also be found on the south-west side of Feya islet, and rather better with some winds than in the bay.

Feya islet is 229 feet high, and has a reef extending off about half a mile to the north-eastward. The islet lies 1¼ miles N.N.E. of the west point of Itapacoroya bay.

A dangerous rock, which always breaks, with 5 to 7 fathoms close to, and 6 to 8 fathoms between it and the shore, lies with Itapacoroya point bearing S.S.W. ½ W., and João Diaz point W. by S. ½ S. nearly one mile. Supplies can be procured at the village.

TAJAHI RIVER.—The entrance to this river is 6 miles southward of Itapacoroya point, between Cabessado point on the south side, and a low neck of land on the north with a spit extending to the southward, rendering the channel narrow and difficult. The spit is marked by a buoy.

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* *See* plan of Itapacoroya bay; scale, *m*=0·8 of an inch, on Admiralty chart, No. 530.

The depth of water obtained by H.M.S. *Albatross*, which entered the river in October 1873, was 2¾ fathoms to the northward of Cabessado point, and 2 fathoms inside the spit, which depth was maintained until near the town of Tajahi, where the depth again increased to 3¾ fathoms.*

Anchorage.—The best anchorage is abreast the church, a little above the town, where the breadth between the 3 fathom lines of soundings is about one mile; the bottom composed of sand and clay.

Tides.—It is high water, full and change, at 2 hours; springs rise 2⅔ feet. During the three days' stay of the *Albatross*, the surface stream was always running out, with a maximum velocity of 1½ knots, checked during the flood.

Supplies, also several kinds of timber can be obtained. Tajahi is in telegraphic communication with Nossa Senhora do Destero, on Santa Catharina island, thence by submarine cable to Rio, &c.

CAMBRIU†, in lat. 27° 1′ S., long. 48° 36′ W., like most of the anchorages on this part of the coast, is open to the north-eastward, but sheltered from all other winds; the bottom is a mixture of sand and mud. The river of the same name which falls into the south-east corner of the bay, is narrow, the bar shallow, and can be crossed only by small coasters. At half a mile off the mouth of the river there is a depth of 3½ fathoms. A dangerous patch of sunken rocks, with 3 feet water, lies 1½ cables north of Cambriu point, which is a prominent high bluff; with Cabras islet in the bay, bearing W. by N. With smooth water, the sea seldom breaks on it.

Porto Bello bay, situated 10 miles south of Cambriu, affords shelter from nearly all winds for vessels of any size. Small vessels can enter the little bay southward of João de Cunha island.

This is one of the principal places for supplying the market at Sta. Catharina, and vessels of the squadron could procure supplies here very much cheaper than at that place.

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* The depths of water on the bar has so much decreased in consequence of the recent great inundations that *at present* only small vessels are able to cross the bar. —Berlin N. to M. 42 of 1883.

† *See* plan of Cambriu anchorage; scale, $m = 0{\cdot}9$ of an inch, on Admiralty chart. No. 530.

There is good anchorage in 9 fathoms, blue marl, with mount Lobos open west of João de Cunha island S.S.W.; and Porto Bello point E.N.E.*

Tijucas bay,† situated just south of Porto Bello bay, is about 5 miles wide between Zimbos and Ganchos points. Zimbos bay, in the north-east part, affords shelter, in 4 fathoms, from northerly winds.

Cruz rocks lie about half a mile off Zimbos point.

Ganchos bay, in the south-west part, affords good anchorage, and water, fresh beef, and stock may be procured from the village. It will be easily known, as it lies under the high sugar-loaf peak named mount Ganchos, 2,000 feet high. Small vessels may anchor here in 3½ fathoms, mud. In entering or leaving this bay care should be taken to give a good berth to Ganchos point, as a reef of rocks, on which the sea breaks only at times, extends half a mile to the northward.

ARVOREDO ISLET.—There are several small islets northward of Santa Catharina; the largest is that of Arvoredo, at the distance of 6 miles; it is high and wooded, with an islet, named Deserta, 1½ miles from its eastern side, and is a good mark for this part of the coast. There is anchorage in the small bay on the south-west side of the island in 11 fathoms, mud.

LIGHT.—From a lighthouse coloured white, 48 feet high, on the south point of Arvoredo islet, is exhibited a *fixed* white light, varied alternately by *white* and *red flashes every two minutes;* visible through an arc of 291° or between the bearings of S. 12° E., through west, and S. 81° E. It is elevated 292 feet above the sea, and should be visible in clear weather from a distance of 23 miles.

Penedos San Pedro islets situated 3 miles W.N.W. of Arvoredo, and between it and the north point of Tijucas bay, are two rocky islets, with a breaker half a mile S.W. by W. of them; and about 4 miles northward, and nearly the same distance from the shore, is the islet of Pedra de Gale, remarkable by long

* *See* Admiralty plan:—Island and strait of Santa Catharina, No. 544; scale, m = 0·7 of an inch. Remark book of Navigating Lieutenant C. B. Clark, H.M.S. *Amethyst*, 1883.

† *See* Admiralty chart:—Sta. Catharina to Rio de la Plata, No. 2,522; scale m = 0·06 of an inch.

white streaks on its steep side, as well as by two rocks which lie off its north-east end. Iris rock, with 14 feet water, lies with the north extreme of Pedra de Gale bearing N.E. by E. ½ E. and Bombas point N. by W.

Arvoredo light is not seen in the vicinity of these islets.

The channels between these islets and rocks are safe, the depths varying from about 8 to 18 fathoms, over oaze and gray sand.

SANTA CATHARINA ISLAND, situated about 8 miles south of Tijucas bay, is separated by a narrow channel from the mainland, it is about 29 miles in length, in a N. by E. and S. by W. direction, and 10 miles across its north end. It is high, with its greatest elevation about 2,000 feet near the south end, and on approaching from the eastward appears much intersected by deep valleys; it may be seen from a distance of 45 miles; the mountains of the mainland are higher, particularly the morro Camborella, a branch of the eastern Cordillera. On the eastern side near the shore is a lagoon, which has an entrance from the sea, 11 miles from the northern extremity of the island; it separates the mountains and forms a conspicuous opening.

The island is fertile, and produces farina, maize, sugar, cotton, coffee, &c., and a variety of fruit. Palm trees may be seen in every direction. The climate is considered the most healthy on the seaboard of Brazil; it has always been remarkably free from epidemics. About four or five hours' ride from the capital are hot springs, the temperature being about 100° Fahrenheit; they are much frequented by people from various parts of Brazil from November to March.

Rapa point.—A reef is reported to extend off Rapa point, the north extremity of Sta. Catharina island.

Islets.—The eastern coast is clear of danger, and may be approached at a prudent distance. There are several small islets off it, which may be seen at a distance of 9 miles; these are the north Moleques, the Badejo, and the two Aranhas at the north-east end of the island. Foul ground is reported off north Moleques, and it is therefore advisable not to round too closely. Isle Xavia, having a flat summit, 164 feet in height, with two small islets westward of it, lies off the middle of the island, 3 miles southward of the lagoon entrance; and about 6½ miles south-westward of Xavia is Campexe isle, westward of which, anchorage will be found with southerly winds. The submarine electric cables are landed on the island nearly abreast of Campexe isle. South Moleques, 360 feet high, and little Moleques

are large white rocks, lying near each other in a north-east and south-west direction; when seen from the south-east they appear steep and conspicuous. Between these rocks and the Trez Irmaõs westward of them, there is a depth of 15 fathoms.

Nossa Senhora do Desterro.—The town of Nossa Senhora do Desterro, the capital, stands on the west side of the island about 15 miles within the northern entrance of the strait. The bay, on the side of a gradually sloping hill, faces the south-west, and has a pleasing appearance from the anchorage. Here is a cathedral, and on the west side of the town, is a large hospital. The population of the island is about 140,000, and that of the town about 5,000. The value of the imports is about 40,000*l.*

The anchorage off the town may be approached either round the north or south end of the island as convenient. There is a depth of 7 feet at the end of the wooden landing mole.

Supplies.—The market place is on the south side of a large square opposite the cathedral, and is well supplied with all kinds. There are several watering places; the best water is procured near the village of San Antonia, 5 miles northward of the town; there is a stream of excellent water in the little bay half a mile west of Anhatomirim islet, on the main, and where supplies may also be procured; good spring water may also be obtained at about one-third of a mile north of Ilhota point. Firewood may be obtained by cutting it at no great distance from the beach. Most kinds of repairs may be done here, and there is good timber of various qualities.

The island has little or no foreign trade, but is visited occasionally by vessels requiring supplies and repairs. If supplies only are required, and a vessel draws 11 feet and upward, she is not required to proceed to the town. The port and other charges on a vessel of 250 tons, entering with cargo and clearing in ballast, is about 13*l.*, and if clearing with cargo about 6*l.* additional.

Coal.—From 400 to 600 tons is kept in stock at the town, and ships of war are supplied, by lighters, if it can be spared. Vessels of 19 feet draught cannot approach the depôt within a distance of 10 to 12 miles. Strong southerly winds blow at times between July and September, but would scarcely affect coaling off the town.

Telegraph.—The town is in connection by electric telegraph with Rio de Janeiro and other places on the mainland.

Pilots can be obtained at the small village near Anhatomirim islet, and from Naufragados lighthouse; mariners visiting the place for the first time will do well to take one.

Anchorage.—A good position will be found in 3½ to 6 fathoms, with Raton Pequeño open of fort Santa Anna; and with the cathedral bearing about N.E. by E. Caution must be used in anchoring as there is a depth of 6 feet only, at 4 cables from the shore.

In the anchorage northward of Praia do Foro, there is reported to be 2 feet less water than is shown on the chart.

LIGHTS.—On point dos Naufragados, south point of Santa Catharina island, from a circular building 149 feet above the sea, is exhibited a *revolving* white light attaining its greatest brilliancy *every minute*, visible in clear weather from a distance of 18 miles.

Tides.—It is high water, full and change, at Anhatomirim islet at about 2h. 45m.; springs rise 6 feet and neaps 4½ feet. The tides are tolerably regular in Santa Catherina channel; they enter from the northward and southward at the same time, and meet off the town, where they also separate. The strength seldom exceeds a third of a mile an hour, but near springs it sometimes runs 1½ miles. It is, however, somewhat influenced by the wind.

Winds.—The ordinary winds in the channel of Santa Catherina follow its direction either from the northward or southward; but they are seldom strong, and the squalls are not dangerous to vessels with good ground tackle. From March to September, being the winter, the winds in the vicinity of the island generally blow from South to W.S.W. sometimes strong and accompanied with rain, but these do not last more than two or three days.

Towards the month of October the winds draw to the eastward and northward, and the six following months of summer are the hottest in the year; squalls during the time are frequent from North round by east to West, and when during this season the wind is from the south-eastward, it is accompanied by much rain. In general, the greatest quantity of rain falls during the months of August and September, but even at this period some years have been exempted.

They have here a proverb, "Pampero a la Missa," as the south-west winds set in once a week, and often on the Sunday. There is

almost always a fresh breeze blowing from one side or the other of the town.

NORTH CHANNEL.—The passage most frequented in approaching the north channel, is between Rapa point and Arvoredo island. It is about 6 miles wide, clear of dangers, and either side may be approached to a prudent distance. Rapa point must not be approached too closely, as a reef of rocks is reported to lie off it. Grossa point, about 6 miles S.W. by W. from Rapa, is foul and should not be approached nearer than a quarter of a mile.

Anhatomirim islet with the fort and white barracks of Santa Cruz, separated from the main by a narrow passage, lies west of Grossa point, and here the channel is about 2 miles wide, with depths of 4 to 5 fathoms; the deepest water is in the middle of the entrance.

LIGHT.—On the south summit of Anhatomirim islet, stands a lighthouse 27 feet high, from which at an elevation of 125 feet above high water, is exhibited a *fixed* white light, visible in clear weather from a distance of 12 miles.

Anchorage.—Anchorage will be found as convenient and is everywhere safe, either northward or southward of Anhatomirim; at one mile south from the fort, there is 4½ fathoms water, muddy bottom, but more shelter and better water will be found rather eastward. Here a vessel will be able to communicate with the village of San Miguel on the main, obtain water from the river of that name in the bay northward of it, and will be in a good position for visiting the town. The water is always smooth under shelter of the high land; the anchorage is open only to the north-east, but the winds from that quarter are not dangerous.

At about 2¾ miles southward of Anhatomirim islet lies Raton Grande islet, and during northerly winds, good anchorage may be obtained in 20 feet, soft mud, about half a mile E.N.E. of the fort on its north end; at three-quarters of a mile farther south lies Raton Pequeño. Raton river is navigable for boats at high water, for 4 or 5 miles; nearly all the produce of the northern part of the island is brought to the capital by this river. Off cape Quebra Cabaço on the main, is a rocky flat named Ipatitinga do Norte, with 4 feet on it at low water.

During the spring tides there is never more than 12 feet water over the flats in the channel; the mud, however, is soft for a depth of

about 4 feet. No damage will occur from grounding, but considerable delay may take place.

Buoys and beacons.—The Lage das Pescadinhas at 2 miles south-east of Quebra Cabaço is marked by a red buoy with flag. Guarazes rocks has, in addition to the beacon, a small white column with a black base on the west side of the reef.

Lage dos Tres Henriques at three-quarters of a mile south of Lage das Pescadinhas; and Gurita rocks at one mile further south are each marked by a red buoy.

Directions.—During northerly winds, the land should be made to the northward; and with southerly winds, to the southward of the intended channel. A vessel of about 12 feet draught can navigate the north channel and if bound for the anchorage of Nossa Senhora do Desterro; steer in for the entrance between Rapa point and Arvoredo island, or to the northward of the latter about midway between it and Penedos San Pedro. Having passed Rapa point, continue to the south-westward midway between San José point and Anhatomirim islet; then alter course to about S.W. ½ S., passing one mile westward of Raton Grande, and when the narrow part of the strait, which is about 2 cables in breadth, and commanded on the east by fort Santa Anna, bears S. by E., steer for it, this will lead between the red buoy of Lage dos Tres Henriques and Guarazes beacons.

The water deepens considerably in the narrows, but shoals again after passing the fort. Gato isle should be passed at the distance of about 1½ cables, when anchor as before directed.

SOUTH CHANNEL.—The southern entrance to the anchorage of Nossa Senhora dos Desterro, is between point des Naufragados, the south-western extreme of St. Catharina island, and Fort islet, the northernmost of three islets lying S.S.W. of it; the outer islets are the largest and named Papagayos, the southern of which is about one mile from the point. At nearly two-thirds of a mile eastward of point dos Naufragados is point dos Fraylès, and beyond in the same direction are the Très Irmaòs islets, the outer one lying about 3 miles from the point.

Between Papagayos islets and point dos Fraylès there is a bank on which the sea breaks. It is 6 cables long in a north-west and south-east direction and 2½ cables across, with 16 feet water. On either side of the bank there is a channel; the north-east channel is

2½ cables wide and has a depth of 24 feet, the south-west is 3½ cables wide and has a depth of 29 feet.

Pinheira rock.—A small but dangerous rock on which the sea breaks with easterly winds, lies directly in the fairway of the south-west channel, having a depth of 9 feet, with 6½ to 7½ fathoms close to.

From the rock, the northern extremity of Pinheira point bears S.S.W., distant 7 cables. Point Pesqueiro Fundo seen open eastward of the central Papagayos islet leads eastward of Pinheira rock.

Cardos island, situated 1½ miles north of Naufragados point, has a shoal of 8 feet, mud, extending in a S.E. by S. direction, nearly 2 cables from its south point. A beacon consisting of a white column with red stripes stands on Cardos island.

Buoys.—Two small red buoys are moored south of Cardos island; the channel lies between them. A small black buoy is moored off Caia Cangossu point, at 3¼ miles north of Cardos island.

Lage do Cacas at 3 miles north of Caia Cangossu is marked by a red conical buoy; the depths have increased south of this danger.

A small black buoy is moored eastward of Largo island at three-quarters of a mile north of Cacas.

A conical red buoy is moored a quarter of a mile E. ½ N. from Abrahao point; and a similar buoy on the edge of the shoals about one mile S.S.E. of Abrahao buoy. Small buoys or beacons mark the rocks near the shore at Nossa Senhora do Desterro anchorage.

Directions.—A vessel entering the south channel should have a pilot, a leading wind, a rising tide, and not draw more than 15 feet water. From the eastward or southward, bring the centre of the south Papagayos islet to bear W.N.W. and steer with it on that bearing until Naufragados lighthouse bears North, then skirt along the islets at about a quarter of a mile distant, passing at one cable from Fort islet. A vessel may also pass between Trez Irmaos islets and the main island, and then between the breaking middle bank and point dos Fraylès, keeping the Santa Catherina side aboard. Between Fort islet and the lighthouse the water deepens to 11 fathoms, but shoals again rapidly in proceeding to the northward. After passing the lighthouse, steer to the northward on the Santa Catharina side, and pass eastward or westward of Cardos island, avoiding the shoal extending south-eastward of it.

When about one cable northward of Cardos island, steer N.W. by W. ¾ W. until Anceada point bears N.N.W., when it may be steered for until point Caia Cangossu bears N.E. ½ E.; thence N. ½ E. until Morro de Ribeirão bears E. ½ N., or nearly up to Cacoa shoal buoy, pass westward of that shoal, observing that the fort on north Papagayos islet kept open west of Cardos isle, until the cathedral opens west of Largo islet, leads clear of Cacoa shoal.*

From off Largo islet, steer about North until Cascas islet bears West; then steer for the city and anchor as before directed. The south Itapitinga rocks which lie east 3¼ miles from Cascas are marked by a red buoy. A sailing vessel should not attempt to enter this channel with a scant wind and falling tide.

The COAST.—The land between Santa Catharina and Cape Santa Marta Grande is high and wooded; the mountains in the interior are covered with clouds when the wind is from the southward, but clear when the wind is from the north-east, they can easily be seen at a distance of 36 miles from the coast. At about 3 miles south of the lighthouse on point dos Naufragados, is the high land forming Pinheira point, and at the same distance south-east of the latter, is Coral islet, 230 feet high, about a mile and a half in extent and covered with trees. At about 23 miles to the southward of Pinheira point is that of Imbituba, with several small capes between, and 4 and 6 miles south-eastward of Imbituba are Araras and Tacami islets.

IMBITUBA BAY.†—Anchorage.—Northward of Imbituba point, there is good anchorage in Imbituba bay in 6 fathoms, hard sand. The anchorage is sheltered from all winds except those between North and E.S.E. A berth may be taken in 7 to 8 fathoms about 2 cables off shore, but the lighthouse should not be brought to bear eastward of S.E. ½ E., as the water shoals rapidly inside that bearing. The bottom is rock in a N.N.W. direction from the point, and is reputed to extend to the opposite shore.

Winds from the N.E. throw in a heavy sea, so that it is not advisable to remain during such winds.

Pier.—In fine weather, vessels of 16 feet draught can lie alongside the pier. The railway runs on the pier, receiving cargo direct from the vessels. Small craft can also obtain shelter south of Imbituba

* Amended from remarks by Navigating Lieutenant E. H. Richards, H.M.S. *Elk*, 1879.

† *See* Admiralty plan :—Imbituba bay, on chart, No. 2,522; scale, *m* = 2·5 inches.

point, and westward of the South islet, in 6 fathoms. This islet must not be rounded too closely, as rocks extend off about the distance of a cable.

Coal.—A railway connects Imbituba with Tubaroa, near which are extensive coal mines. The coal will be brought to the jetty for shipment, and it is proposed to build a breakwater from the point, to protect the pier.

Supplies, such as eggs and poultry, can be obtained at moderate prices.

LIGHT.—On Imbituba point from an iron standard 20 feet high, is exhibited at an elevation of 69 feet, a *fixed* white light, visible seaward between the bearings of S.E. and N.W. by N., and should be seen in clear weather from a distance of 10 miles. The keeper's dwelling, painted white, is the only house visible in the offing.

Barra da Laguna (Lagoa).—From Imbituba point, a low flat tongue of land forming the Imaruy lagoon extends in a south-westerly direction for 16 miles to its entrance, at 5½ miles northward of which, and 2 miles from the shore, is Lobos isle. The bar is dangerous, and has from 6 to 10 feet over a breadth of half a cable; but occasionally there is said to be only 4 feet of water on it. Vessels of 7 or 8 feet draught can sometimes enter the lagoon. Inside, on the south part of the tongue of land, about a mile northward of the bar, is the town of Barra da Laguna, or Lagoa, which carries on a small trade with Rio de Janeiro, and is in telegraphic communication with it. At the north end of the lagoon is the town of Villa Nova or Santa Anna.

CAPE SANTA MARTA GRANDE, at about 6 miles south-westward of the entrance to Lagoa, is the termination of the line of mountains that backs the coast to the northward, and is remarkable by having on its summit several white places, which from a distance appear like houses; when bearing N.W. by N. about 10 or 12 miles distant, the cape appears like an island sloping to the south-east, the lower part being sand.

LIGHT.—On cape Sta. Marta Grande stands a lighthouse 94 feet high, from which, at an elevation of 250 feet above the sea, is exhibited a *fixed* and *flashing* white light with a *red* sector (also fixed and flashing) over Campo Bon rock. The light shows *two flashes* in

quick succession, and should be seen in clear weather from a distance of 22 miles. The lighthouse consists of a square white tower above a square white keeper's dwelling.

The COAST from cape Santa Marta Grande trends south-westward for about 275 miles to Rio Grande do Sul. The only known danger is the Campo Bon rock, stated to be situated about 12 miles S.W. by W. of the cape. The white sandy shore is all along extremely low, variegated only by little hills and stunted bushes, and can be seen only in clear weather from aloft at a distance of 7 or 8 miles, and from the deck of a vessel at not more than 3 or 4 miles. The first part of it, as far south as the Tramandahy river, in about latitude 29° 57′ S., is named Torres beach.

As Torres.—At 63 miles south-west of the cape is the town of As Torres (The Towers); here is a small bay which has been favourably reported on by engineers as a suitable place for the formation of a harbour. At about 2 miles north of the town, is the mouth of the Manpituba river. At one mile eastward of the town is a low islet about a cable in length. The Tramandahy river, at about 40 miles south-west of As Torres, is formed by the connexion of several lakes which overflow into the sea.*

LIGHTS.—As Torres light *intended.*
Tramandahy light *intended.*

The COAST southward is known as the Praia do Pernambuco or Tramandahy, as far as Mostardas in 31° 20′ S.; here it forms a bay in which small vessels sometimes obtain shelter from continued south-westerly winds. The town of Esmenigildo stands W.S.W., distant about 9 miles from the point. Southward of this bay, to the bar of Rio Grande do Sul, the coast is named Estreito beach, the town of that name standing about 25 miles north-east of the bar of Rio Grande.

The coast is a little more elevated than that northward of As Torres, especially midway between the towns of Esmenigildo and Estreito, there being more vegetation and hillocks. The trees end about 15 miles north of Rio Grande do Sul. Along the whole of this part of the coast, villages may be seen in clear weather at a distance of 3 or 4 miles from the shore. The south-east winds blow on it with much force and cause a heavy sea; these winds are preceded by those from the south-west.

LIGHT.—Mostardas *lighthouse building.*

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* At Torres and Tramandahy, lights *intended.*

Winds.—The prevailing winds on the coast of Rio Grande do Sul are the N.E. varying from N.N.E. to E.N.E.; and S.W. varying from S.S.W. to W.S.W.; the former blowing chiefly from November to May, and the latter in June, July, and August. N.E. winds usually continue from three to five days, sometimes lasting with little intermission much longer; they generally commence weak and gradually increase in force; they are often rainy, and succeeded by a calm, and an atmosphere much charged with electricity; when they blow with much force it is a sign of a south-west wind.

S.W. winds on the contrary are at the first most violent, commencing usually by a sudden gust; they may last very steadily for two or three days, and have much more force comparatively than the north-east winds, and usually clear the atmosphere. An east wind occasionally succeeds the north-east, and the south and south-east follow the south-west. West and west-north-west winds are rare, but usually usher in unfavourable weather. The south-east winds blow with much force and cause a heavy sea.

It may be observed that the indications of the approach of the south-west winds or Pampero, are almost unerring, and can usually be detected from 12 to 36 hours before it comes on; it will occur after a succession of winds from the north-east, and the longer the duration of winds from that quarter the more violent will be the south-west blast; a calm will usually succeed the north-east winds, the sky will be cloudy, the atmosphere heavy and charged with electricity, the thermometer will rise, and the barometer fall, and in the horizon from north to west a misty atmosphere will appear, in which much lightning will usually show at night; and in the western and south-western horizon dark clouds will gradually rise, accompanied by thunder and lightning until the wind comes on in its full force.

Several hours before the wind is felt, the water on the bar of Rio Grande do Sul will rise, from the accumulation of the sea between the banks at the bar and the coast to the southward, and a ground swell from the southward will be experienced.

The current between Sta. Catharina and Rio de la Plata has a tendency to set from north to south, and during the north-east winds it sometimes runs at the rate of 40 miles a day. There appears to be some doubt as to the current here being wholly regulated by the winds, though it is possible that a continuance of south or south-westerly winds may occasionally check or overcome it from the northward. During south-east winds the sea is always heavy, and

then the current sets towards the shore, and several wrecks are believed to have taken place in consequence.

COAST.—The province of Rio Grande do Sul, the most southern in Brazil, bounded on the north by the Curitiba and the province of Santa Catharina, and on the south by that of Uruguay, is about 385 miles in length, and may have an average of 220 miles in breadth, containing an area of 85,240 English square miles, with a population of about a million. It consists chiefly of large plains covered with herds of cattle, and mountain ridges traverse it in various directions, but none of them of any great height.

Several large rivers have their source in this province, of which the Uruguay, the Jacuhy, and the Camapuam are the most important.

RIO GRANDE do SUL.*—Towns.—The town of Rio Grande (or Saõ Pedro do Sul) is built on the north side of a low peninsula not more than 3 or 4 feet above the water, about 6 miles within the entrance points of the river; it is of some extent, containing (1890) about 22,900 inhabitants, of whom a large number are Portuguese and Germans; its extremely low situation subjects it to occasional floods. Saõ José do Norte stands about 2½ miles E.N.E. of it on the eastern side of the river; the ports are quite distinct, and for many years had separate custom houses.

The principal articles of export consist of hides, horns, bones and bone ash, dried beef, wool, hair, agate, pebbles, &c. The value of the exports (1889) amount to 18,240,000 milreis, imports the same. In 1889, the number of British vessels that entered the river was—Steam 48, tonnage 17,499; sailing 75, tonnage 11,169; cleared steam 47, tonnage 16,928; sailing 73, tonnage 11,328.

A railway is in course of construction from Bagé, and which is intended to join that from Port Alegré to Uruguayana. There is also constant steam communication with Rio de Janeiro, Monte Video, and other ports.

Coal.—About 350 tons of coal is usually kept in stock at Rio Grande do Sul.

Patent slip.—A patent slip has been constructed which will take vessels not exceeding 10 feet draught.

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* *See* Admiralty plan :—Rio Grande do Sul, No. 2,002; scale, *m* = 2·2 inches.

The BAR.—The banks surrounding the bar of Rio Grande do Sul are composed of fine sand, and extend about 2½ miles southward of the entrance points; they are continually changing their position, and therefore no stranger should attempt to cross the bar without a pilot. The bar is indicated by the breakers on either side, and lies about south from the lighthouse; the deep water channel is marked by buoys, the position and colour of which are subject to constant change. Temporary signal staffs are erected on the beach to direct vessels in the deepest water.

Vessels must lighten to the depth of water on the bar, and no opportunity should be neglected in crossing. It is contemplated to deepen the bar, by the use of powerful dredges. During the year 1889, vessels drawing 9 to 13 feet entered the river. H.M.S. *Beagle* (1891) found 15 feet water on the bar.*

The highest water is caused by the pamperos or south-west winds, when vessels may cross the bar at its commencement, if prepared to take advantage of it; but if the wind should be strong, it soon causes a heavy sea on the bar, when they cannot enter; and should it veer to the south-east (which it sometimes does), and blow hard, the water on the coast being shallow the sea rises quickly, and it becomes dangerous for deeply laden vessels, consequently many are lost in the neighbourhood of the port. It is advisable for vessels of 10 feet draught to have a steam-tug, unless there is a fair wind with a good breeze.

There is a channel carrying 4 feet water between the south-west bank and the west point of entrance to the river, available for boats, and convenient in giving assistance to vessels in distress about the south-west banks. Pilot boats when caught to leeward, use this channel. There is also a channel northward of the bar.

Buoys.—Two black buoys are moored in about 5 fathoms, 5½ miles S. by W. ¼ W. from the tower, and a red buoy a quarter of a mile W.N.W. of the inner black buoy. These are the outer buoys, inside which is considered pilotage waters.

The Channel from inside the bar to São José do Norte is regular, and bounded on either side by low sandy land; the hillocks on the western side vary from 30 to 80 feet in height, terminating at Mangueira point, where there is a flagstaff which communicates with San Pedro do Sul.

* In 1892 the depths over the bar were said to exceed 14 feet on 250 days.

From the extremity of the peninsula of San Pedro do Sul, a shallow sandy flat extends to the eastward about one mile, and forms the western side of the channel leading to San Pedro do Sul, which is very narrow and marked by buoys. In it the depths are from 9 to 20 feet. The eastern and northern sides of the channel is formed by extensive sand flats, connected to Marinheiros island; eastward of these flats is the main channel of the river.

The shore on the eastern side of the main channel is bordered by an extensive shallow flat, which runs nearly north, and at one mile north-east of the lighthouse extends one mile off shore, when it trends to the north-eastward, and terminates at the commencement of the sand-hills 30 to 90 feet high, southward of São José.

LIGHT.—From the light tower, at one mile within the east point of entrance to the river, is exhibited a *fixed* white light for *thirty seconds*, then *one flash* and a short eclipse *every six seconds* in the *next thirty seconds*, thus completing the revolution in *one minute.* It is elevated 114 feet above high water, and should be visible in clear weather from a distance of about 16 miles.

The lighthouse, 97 feet high, is painted a light red colour.

Signals.—When within signal distance of the watch tower, the vessel should hoist the signal of her draught of water, and for this purpose she should be prepared with a red flag, a white flag, a blue flag, and a blue pendant. The signal should be hoisted so as to be clearly seen from the watch tower, and in order to prevent mistakes no other signals if possible should be made at the same time.

The signal to approach the bar is a red flag hoisted at the large flagstaff of the watch tower, and will be always hoisted when the bar is practicable; but it must be understood that those vessels alone are to comply with it, whose draught of water may be equal to or less than that indicated at the same time, by the signal exhibited from the smaller flagstaff of the watch tower.

When the signals are hauled down from the watch tower, or pilot boat stationed at the bar, vessels cannot enter, and they should immediately stand off. From want of attention to the signals, the red flag is often hauled down, in consequence of one or more vessels running into danger; thus obliging all to haul off, some losing their chance of getting in through the neglect of others.

The following signals are hoisted at the small flagstaff of the watch tower, and at the pilot boat at the bar, to indicate the greatest draught with which a vessel may pass the bar, and not the depth of water on the bar.*

Signals.	Significations.
A white flag - - - - -	7 feet 3 inches vessels' draught.
A blue flag - - - - -	7 „ 8 „ „
A red flag - - - - -	8 „ 0 „ „
A white flag over a blue one - - -	8 „ 4 „ „
A blue flag over a white one - - -	8 „ 9 „ „
A white flag over a red one - - -	9 „ 2 „ „
A red flag over a white one - - -	9 „ 6 „ „
A blue flag over a red one - - -	9 „ 10 „ „
A red flag over a blue one - - -	10 „ 2 „ „
A blue burgee over a white flag - -	10 „ 6 „ „
A white flag over a blue burgee - -	11 „ 0 „ „
A blue burgee over a blue flag - - -	11 „ 3 „ „
A blue flag over a blue burgee - -	11 „ 7 „ „
A blue burgee over a red flag - - -	12 „ 0 „ „
A red flag over a blue burgee - - -	12 „ 4 „ „
A blue burgee over a white flag, with a blue flag under.	12 „ 8 „ „
A blue flag over a white flag, with a blue burgee under.	13 „ 2 „ „
A blue burgee over a white flag, with a red flag under.	13 „ 6 „ „
A red flag over a white flag, with a blue burgee under.	13 „ 10 „ „
A blue burgee over a blue flag, with a red flag under.	14 „ 2 „ „
A red flag over a blue flag, with a blue burgee under.	14 „ 7 „ „
A red burgee over a white flag, with a blue flag under.	15 „ 0 „ „

When, for a want of a favourable wind, vessels inward or outward bound can only proceed by towage, a white flag with red swallow-tails will be hoisted above the signal indicating the number of feet on the bar; which will be repeated by the pilot vessel stationed there.

* The Brazilian Government have adopted the International code of signals, but at Rio Grande do Sul the red, white, and blue flags, which are very small and indistinct, are used for bar depths.

The signal for a steam tug, is the national flag hoisted at the fore over the flags for the draught of water.

For vessels at the anchorage near the lighthouse, and about to leave the port, the depth of water will be shown by signal from the flagstaff close to the pilotage wharf; and whenever this depth is sufficient, they are at liberty to proceed, after having been visited by the bar master. They should be ready to sail on the shortest notice, as a delay of a quarter of an hour, together with the time required to be at the bar, may for weeks deprive a vessel of the chance of getting out. The pilots do not always go on board, but keep ahead in their boats and direct the course of the vessel by waving the flag.

There is a telegraph by flags between the village at the bar and the town of San Pedro do Sul, by which a communication may be made by vessels at the anchorage west of the lighthouse or those coming in, through the pilot, with the consul or a vessel's consignee. The signals are exhibited from staffs, one near the wharf, in front of the lighthouse, called the pilotage wharf; the second on the west side of the river; and the third on the theatre at San Pedro do Sul.

Pilots.—Government pilots are supposed to take all vessels across the bar and up to the first anchorage, the charge from thence to San Pedro do Sul being 16 dollars for all foreign vessels. The bar should never be crossed without a pilot on board, unless the bar boat is at her station on the bar. When the bar boat is unable to remain out and the bar is still practicable, pilots come out in steam tugs. The signal for a pilot is the vessel's national flag under the signal of her draught of water at the fore; the pilots do not always go on board, but direct the vessel by the waving of a flag.

Anchorages.—Vessels awaiting an opportunity to enter the river anchor about 1½ miles south-east of the bar in 7 fathoms, with the lighthouse bearing about N.N.W. distant 4½ miles. There is some difficulty in weighing, if the anchors have been down long, as they sink deep into the sand which lies under the mud.

The port of Rio Grande do Sul from the entrance points to about half a mile north of Saõ José do Norte, is about 7 miles in length, and in navigable waters about half a mile in width.

In this space there are four anchorages; that west of the lighthouse about 3 miles inside the bar, is good holding ground in

5 to 7 fathoms, sand and mud; here all vessels remain after entering the point until they have been visited by the authorities.

The second anchorage is at the confluence of the channels which run respectively to the town of San Pedro and to that of Saõ José. Vessels which have not a fair wind for San Pedro do Sul, usually anchor here in 2½ to 5 fathoms water, the bottom being mostly mud, but the anchors occasionally drag.

The anchorage at Saõ José is capable of accommodating a large number of vessels in from 5 to 7 fathoms, sand and mud, good holding ground, and well sheltered from all winds excepting the S.W.

The anchorage of San Pedro do Sul is sheltered from all winds excepting those from the north-east, but vessels occasionally drag their anchors.

The Brazilian vessels are moored to the westward of the custom-house wharf, and foreign vessels to the eastward, and secured head and stern. The wharves are left clear for lighters and coasting steamers.

Tides.—The tides in the harbour sometimes run strong, but irregular as to time, their direction and velocity appear to be entirely governed by the wind; the highest water occurs immediately before and during the continuance of south-westerly winds, which blow occasionally, generally lasting two or three days. North-east winds lower the river. A current of about 3 miles an hour runs out of the river during the ebb, and carries the discoloured water some distance beyond the bar, presenting the appearance of shoal water which in reality does not exist. The ordinary rise is from 1½ to 2 feet.

Directions.—During north-easterly winds, a vessel should approach the bar of Rio Grande do Sul from that quarter, make due allowance for a strong southerly set, and go no farther south than lat. 32° S. until her position is ascertained. As shoal soundings extend some distance from the coast, the lead should always be used, especially during hazy weather, and on no account to shoal into less than 6½ fathoms, unless the position of the vessel is known; and in running to the southward, close the coast a little northward of the lighthouse, when two towers of the church of Saõ José do Norte will be seen, then the lighthouse and watch tower will appear like two sails.

When the wind is from south-westward the lighthouse should be made from the southward, and in either case keep in not less than 7 fathoms water. The lighthouse may be approached on a N.N.W. bearing to that depth.

Unless the weather is unusually fine, the sea breaks occasionally on the bar, and as the bar frequently changes its position, no vessel should attempt to cross it without a pilot, but in case of necessity or in vessels of light draught, the following directions should be attended to. Having sighted the lighthouse, hoist the signal of the vessel's draught of water, so as to be clearly seen, when on being repeated from the small staff on the watch tower and the signal made to close, the red flag hoisted at the tall staff, steer towards the lighthouse for the opening between the breakers, attending to the signals.

On approaching the pilot or bar boat, which is usually anchored on the bar close to the deepest water, steer directly towards her, observing her signal of the depth of water on the bar, which will be repeated by the watch tower. Should the signal shown indicate a depth of water equal or more than the vessel's draught, she may confidently proceed on; but if the signal of the depth of water exhibited from the pilot boat or watch tower, or the red flag at the large staff on the latter be hauled down, the vessel should stand off and on, or anchor for a more favourable opportunity.

On approaching the pilot boat, a red flag will be waved from her in the direction the vessel is to steer; when held upright steer directly towards her. There is occasionally another pilot boat stationed in the inlet between the bar, and the anchorage west of the lighthouse, which also directs the course of the vessel with a moveable red flag. If the second boat should be in her station the vessel will be guided by its signals, immediately after passing the first pilot boat; but, if it should not be there, she may act according to the signals of the first pilot boat.

If neither of the pilot boats are in their stations, and the red flag from the watch tower, the signal to approach, continues to fly, the vessel should act wholly on the signals from the watch tower, where on extraordinary occasions a red flag may be shown to guide vessels, as shown from the pilot boats. When over the bar, steer to the northward between the buoys marking the channel. When well inside the bar the water deepens rapidly, the channel widens, and the bank on either side shows distinctly.

In proceeding up the channel, keep along the western shore where it is steep-to, particularly abreast the sand-hills; when abreast Mangueira point, steer towards the sand-hills with a remarkable tall house amongst the trees, a little on the starboard bow, and along the eastern shore, keeping the buoy on the flats extending

from the western shore, on the port side, and anchor where convenient off Saõ José.

The channel to San Pedro do Sul is narrow and circuitous; caution is required in taking it, for if a vessel grounds when the water is high, considerable delay and expense may ensue. A vessel should have a fair wind, or employ a steam tug.

LAGOA DOS PATOS.—Channel.—This extensive lake, of which the Rio Grande do Sul is the outlet, is the largest in Brazil. It is about 120 miles in length in a north-east and south-west direction, and 25 miles wide. It is separated from the sea through its entire length, by a sandy peninsula averaging about 5 miles in breadth. This lake receives nearly all the streams which irrigate the northern and eastern portions of the country, and its water continues fresh as far south as Marinheiros island, near the towns of Saõ José do Norte and San Pedro do Sul, often called Rio Grande do Sul.

Between Saõ José do Norte and Cangussir island 22 miles to the northward, the lake is shallow, and the channel, marked by means of stakes driven into the ground, which often disappear, is intricate. The shoalest water in this part of the channel is in Cangussir pass, where there is about 10 feet, soft muddy bottom.* After passing Cangussir, the channel is easy, and along the eastern shore from light to light (placed on the principal points), with depths of 3 to 4 fathoms as far as Itapuan point. From the latter place to Porto Alegre, the channel again becomes intricate and shallow, the worst places being staked off. The current, if any, follows the direction of the wind. There are numerous shoals in the lake, but which the lead will give timely notice of the approach to.

Porto Alegre, the seat of government of the province, and containing (1892) a population of 50,000 inhabitants principally Germans, is situated at the northern extremity of the lake, at about 130 miles northward of the town of Saõ José do Norte. The houses are built in the usual style of the country, with good streets; there is a hospital, an arsenal, and numerous wharves for coasters. Means exist for heaving vessels down. The exports are chiefly hides, tobacco, and grain. A railway is in progress, to connect port Alegre with Uruguayana in the Banda Oriental.

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* Lieutenant F. Powell, H.M S. *Beacon*, 1877.

The climate of the province is mild and healthy, the greater part of the soil is fertile, and produces various kinds of grain and many of the fruits of Europe; the country has been styled the granary of Brazil. Timber is not very abundant, but of good quality. Among the minerals are gold, silver, iron, sulphur, and porcelain clay. The rearing of cattle, however, is what chiefly distinguishes the country, and gives employment to its inhabitants, an athletic and robust people. Horses and mules are bred to a great extent, and are highly valued for the excellence of their breed.

The anchorage at Porto Alegre is off the north side of the town in about 2 fathoms.

LIGHTS.—Fixed white lights are exhibited on the eastern shore of the lake, at Sarangonha island, Estrieto point, Bojuru point, Marco cape, Christovao Pereira point, and Itapuan point.

Pelotas.—The town of Pelotas is situated 10 miles above the bar of the river of that name, in the south-west corner of the lake. There is a depth of about 11 feet on the bar, and anchorage off the port in 2½ fathoms. The town distant 1½ miles from the port is connected by a tramway.

The COAST of Albardaõ, or Albardon de Juan Maria, which may be assumed to extend from the bar of Rio Grande do Sul to the embouchure of the river Chuy, a distance of about 120 miles, consists of a narrow and flat strip of land forming a boundary between the sea and lake Merim, with some smaller inland lakes; from the bar of Rio Grande do Sul to cape Castillo, the water is shallow, having midway at about 17 miles from the shore only 10 fathoms; nearer the shore the bottom is irregular, with patches of less than 5 fathoms. Several vessels of 10 feet draught have navigated close along this shore. Vessels of large draught should not, however, approach it too close.*

The first remarkable object southward of the entrance to the Chuy, is a rocky point with a few isolated and partly submerged rocks off it, named Castillos Chicos; 3 miles beyond is the fort of Sta. Teresa, and 5 miles farther south is Palmer point, which forms

* Caution.—The coast of Albardaõ is frequented by wandering ill-disposed men, known by the name of "Montoneros." These men commonly flock to the shores of the sea whenever they nourish hopes of plunder, and convey everything they can pilfer quickly into the interior, with little probability of their being captured.

the northern extremity of Castillo bay. Thence the flat sandy shore curves to the south-westward, and at the distance of about 20 miles is cape Castillo. At about 16 miles northward of the cape are two hills named Mount de los Difuntos and Navaro hill, lying nearly east and west of each other.

Banks.—Between the bar of Rio Grande do Sul and cape Castillo, a depth of 10 fathoms will generally be found about 14 miles from the land, but between latitude 32° 40′ S. and 33° 30′ S., the bottom at a distance of 10 miles from the shore is irregular, with patches of less than 5 fathoms. H.M.S. *Curlew* in 1865 found bottom at 6¾ fathoms at 13 miles from the coast in latitude 33° 13′ S., and a bank of 10 fathoms, 15 miles south-eastward of it; other shoal casts of 8 and 9 fathoms named Triton, Bouverie, and Lecky bank will be found at a distance of about 30 miles from the land in this locality. A bank of 8 fathoms, sand and shells, has been reported 33 miles eastward of the entrance to Rio Grande do Sul, position not known.

Nelson bank. of 19 fathoms, lies about 270 miles eastward of Rio Grande do Sul, in about lat. 32° 30′ S.; long. 46° 45′ W.

CHAPTER VI.

RIO DE LA PLATA; NORTH COAST; CAPE CASTILLO TO COLONIA.

Variation in 1893.

Cape Castillo	5° 20′ E.	Monte Video	7° 0′ E.
Lobos island	6° 30′ E.	Colonia	8° 10′ E.

THE RIO DE LA PLATA,* discovered by Juan Diaz de Solis in 1515, is a large estuary at the confluence of the rivers Parana and Uruguay. It is about 150 miles in length in a W.N.W. and E.S.E. direction, and its breadth at the entrance, between Punta del Este on the north and cape San Antonio on the south, is 120 miles; but it suddenly narrows, as at Monte Video it is only 50 miles wide; between Colonia and Punta Lara below Buenos Aires, 20 miles; and at the mouth of the Uruguay and the Boca de Guazu, (Parana,) little more than 4 miles. It is a remarkably shallow estuary, and above Monte Video two-thirds of it is blocked up by shoals with less than 12 feet water over them.

The nature of the bottom of the La Plata is variable; on the banks it is a very fine hard sand; in the deeper portions it is ooze of a neutral tint, soft, and of a sticky nature.

The north shore is comparatively high and rocky. The whole southern shore is low, uniform in appearance, and bordered by a bank. The 3-fathoms line of soundings extends northward of cape San Antonio to a distance of 9 miles, then curves round the bay of San Boronbon, passing 12 miles south-east of, and 25 north-east of Piedras point, joining the tail of Ortiz bank, and forms a bar of that depth, about 9 miles wide, inside of which the water deepens; thence the 3-fathom line continues to the westward, at the distance of from

* *See* Admiralty charts:—Santa Catharina island to Rio de la Plata, No. 2,522, scale, $m = 0{\cdot}06$ of an inch: Rio de la Plata, No. 2,544, scale, $m = 0{\cdot}2$ of an inch; and Parana and Uruguay rivers, No. 2,039, scale, $m = 0{\cdot}5$ of an inch.

5 to 10 miles off the southern shore. English bank occupies a large space in the fairway of the entrance, and the Ortiz bank stretching southward from the north shore, with that of the Chico bank on its south-west side, are the great impediments to the navigation of this large and important inlet.

On account of the large body of water brought down by the rivers, which drain an area of about 1,200,000 English square miles, and the general movements of the waters being greatly influenced by the wind, the currents are variable. In light winds and fine weather, the tides are generally regular, but the mouth of the estuary being wide and shallow, the water flows easily in when the wind is from seaward, and is forced rapidly out when the wind is off the land. *See* page 274.

The water continues fresh as far down as the river Santa Lucia, 12 miles above Monte Video, when it becomes brackish. It discolours the sea at a distance of about 75 miles from the mouth of the river. Vessels of large draught may navigate as far as Monte Video, and those of moderate draught to Buenos Aires, and Hornos islets north-west of Colonia. Small vessels enter the inner road of Buenos Aires to within about half a mile of the town.

CAPE CASTILLO.—We begin the description of the north shore of La Plata at cape Castillo, as it is the most northerly point that a ship should sight, if from the state of the weather or the position of the vessel it should be thought prudent to make the land before running up to Lobos islet. This cape is easily distinguished by a white rounded sand-hill, 184 feet high, and named Buena Vista, at its back, with its summit towards the north west ending in a sandy peak. There are patches of black bushes on its white sides, and its isolation and peculiar form render it a good mark for this part of the coast. It may be seen in clear weather from a distance of about 15 miles, the soundings will then be from 15 to 20 fathoms. Polonia light, 3 miles southward of cape Castillo, should also be seen. In case of need, fair shelter may be found against south-west winds in Castillo bay, northward of the cape.

Pilots.—A pilot cutter, with pilots for Rio de la Plata and other ports in Brazil, will be found cruizing in the vicinity of cape Castillo. Vessels for Rio de la Plata are strongly recommended to employ them. In bad weather they sometimes run to capes Castillo or Santa Maria for shelter, and with strong easterly winds to Maldonado. The pilot

cutters carry a large blue flag at the masthead (International signal flag P).

Castillo Grande islet, 102 feet high, is situated 1¼ miles E.S.E. of cape Castillo. Little Castillo lies three-quarters of a mile west of it, nearly half a mile from the shore. In the channel between the two islets there are depths of 8 to 9 fathoms, sand and mud.

Castillo bay.*—From cape Castillo the coast to the north-west forms a small sandy bay, where boats may land. The shore continues low to the northward for a distance of 1½ miles, where Castillo lagoon has its outlet.

Anchorages.—In Castillo bay vessels may find shelter from winds from S.S.E. round by the south to N.W. The best anchorage is with the summit of Buena Vista bearing about S.S.W. ½ W., at 3 or 4 cables from the point, in a depth of 4 to 5 fathoms, hard sand. Before dropping the anchor it is necessary to be sure of the nature of the bottom, as patches of rock are scattered about.

There is anchorage also in 3 fathoms, fine sand, in the bay formed by cape Castillo and Little Castillo, at 2 cables from the shore; and in case of its coming on to blow from the north-east, a vessel could get out between the islet and Coronilla point, where there is a depth of 3 fathoms in the channel, three-quarters of a cable wide.

These anchorages were formerly much frequented. Many a vessel disabled by a pampero at the embouchure of the La Plata has been obliged to bear up for Santa Catharina or Rio de Janeiro to repair damages; others have been driven off a long way to sea, whereas had they known of these anchorages close at hand they might have run for them. It is, however, necessary, should the wind shift to the north-east, to proceed to sea immediately, as that wind raises a heavy sea on this coast.

In the angle of the bay at the foot of Buena Vista there is a small stream where boats can obtain fresh water easily. There is no fuel but the brushwood on the hill.

CAPE POLONIO lies 2½ miles southward of Coronilla point, the intervening coast being sandy downs from 12 to 18 feet high. The cape is a steep rocky promontory forming three points; that to the south-east being named Polonio; above it is a greenish

* *See* Admiralty plans:—Castillo and Polonio bays; scale, $m = 1{\cdot}4$ inches, on chart No. 2,522.

cone-shaped hill, rising about 120 feet above the sea, which seen from the south-west or north-east assumes the appearance of an island. In the bay between capes Castillo and Polonio there is anchorage with off-shore winds in a depth of 5 fathoms, at half a mile, and in 7 or 8 fathoms at one mile from the shore, sand and mud.

Shoal.—Captain F. Rodgers, U.S.S. *Philadelphia*, 1892, reports that at about 18 miles in an E. by N. ½ N. direction from cape Polonio much discoloured water was observed, and a sounding of 8 fathoms obtained, hard gravel bottom, where 13 fathoms was formerly supposed to exist in lat. 34° 20′ S., long. 53° 26′ W. (approximate).

Caution is necessary when navigating in this vicinity, as shoaler water may exist.

LIGHT.—On cape Polonio, from a lighthouse constructed of gray masonry, with three white horizontal bands, is exhibited a *fixed* white light, elevated 137 feet above the sea, and should be visible in clear weather from a distance of 18 miles. The lighthouse appears like a sail when sighted from the northward, and the bands from want of whitewash are scarcely to be distinguished.

Torres islands are a group of three arid rocks from 12 to 18 feet high. The two inner, named Raza and Encantada, are surrounded by a reef; the third, named Islote, lies 1¼ miles East from the cape, and at a cable to the north-east of it is a detached rock generally above water. A dangerous reef, barely awash, named the Bisson, lies midway between Islote and the other islets. Torres rocks, as well as the Castillos, are much frequented by seals.

Anchorage.—There is fair anchorage with tolerably even bottom in the bay north of cape Polonio, in 5½ fathoms, with Islote bearing S.E. by E., and the lighthouse S.W. by S.*

Polonio rock is a dangerous rocky shoal lying 2⅓ miles S.W. by S. from the cape. It extends half a mile in an E.S.E. and W.N.W. direction, and the least water over it is 11 feet, while close alongside there are 11 fathoms. The shoalest spot, which breaks in rough weather, is one-third its length from its western end. Between the shore and the reef there is a passage 2 miles wide, with 10 and 11 fathoms sand and mud, but the mariner is cautioned to make well

* Captain W. J. L. Wharton, H.M.S. *Sylvia*, 1883.

sure of his bearings before he trusts his vessel in the vicinity of this dangerous shoal.

Polonio bay, situated on the west side of cape Polonio, affords fair anchorage with off-shore winds, in 7 fathoms, fine sand, with the cape bearing N.E. by E.; it is, however, necessary to proceed to sea should the wind veer to the eastward of N.E. A vessel, if detained in this neighbourhood, may anchor northward or southward of the cape according to the wind; at times a heavy swell sets into these small bays.

Tides.—It is high water, full and change, at cape Castillo at 8h. 30m. The rise is much influenced by the wind: southerly and south-east winds often raising the water 6 feet, and occasionally 9 feet, as shown by the marks left by the sea on the rocks. In fine weather the tides are tolerably regular, and the rise at springs is about 2 feet.

Rubia (Red) point.—The coast from cape Polonio extends in a low range of sandy downs, south-west for 20 miles, to a red cliff, about 50 feet high, named Rubia, which is remarkable as the only cliff of that colour in the whole extent of the embouchure of the La Plata, whence it takes its name. From a distance it resembles an island.

With the exception of Polonio rock the coast is clear of danger.

CAPE SANTA MARIA,* known to the natives as Punta de Rocha, is a low point, 4¾ miles southward of Rubia point, the coast between forming a small bay. A reef of rocks extends one cable to the southward of the cape.

There is anchorage west of the cape, with off-shore winds, in 6 or 7 fathoms water, about three-quarters of a mile from the beach.

LIGHT.—On cape Santa Maria, from a lighthouse 125 feet high, is exhibited, at an elevation of 132 feet above the sea, a *revolving* white light, which attains its greatest brilliancy *once in every minute*, and should be visible in clear weather from a distance of 18 miles.

Rock.—In 1865 the steamship *Herschel* struck on a rock stated to lie off cape Santa Maria. In 1871, H.M.S. *Speedwell*, in searching for the rock, found a depth of 6½ fathoms at 2 miles E. by N. ½ N. from

* *See* Admiralty plan:—Paloma harbour and roads on chart, No. 2,522; scale, = 1 inch. Remarks on Paloma harbour, by Commander C. G. Jones and Navigating Sub-Lieutenant L. G. Stovin, H.M.S. *Pert*, 1872.

cape Santa Maria : until the existence of the danger is ascertained, vessels should give the cape a good berth.*

Bank.—Mr. Slack, master of the *La Place* in 1872, reported a dangerous sand-bank off cape Santa Maria. The bank lies parallel to the shore about 2 miles distant; its south-west end, which is perfectly distinct, bearing about South from the flagstaff at port Paloma. There appeared to be a deep channel inside the sand-bank.*

Paloma harbour and road.—A short distance to the northward of the cape are two small islands, which together form the small harbour of Paloma. The northern islet named Paloma, 26 feet high, is the larger ; a reef, on which the sea breaks heavily, extends 4 cables north-eastward of it : Tuna or Espinosa, the other islet, is low, sandy, and covered with brushwood.

Paloma harbour is a circular basin about 4 cables in diameter, having a general depth of 8 or 9 feet, hard sand ; it is well adapted for a few small coasters. The entrance, which is between the two islets, is narrowed by the reefs which extend from either islet towards the centre, and form a channel about 50 yards broad. Nearly in the centre of the channel there is a rock having a depth of 7 feet; the deepest water is on the Paloma side. By keeping as close as possible to the edge of the surf on that side, will lead in about 11 feet water, and clear of the rock, which it will be prudent to buoy before the vessel enters. The channel on the other side of the rock has a depth of only 8 or 9 feet, uneven bottom. Just inside the entrance there is the deepest water, about 15 feet ; moor N.E. and S.W., as the space is very confined.

H.M.S. *Pert*, drawing 9 feet, entered Paloma harbour in November 1872, and rode out a heavy pampero there. The marks on the rocks indicated a rise and fall of about 3 feet, but the tides are much influenced by the winds. There is a small stream of fresh water at the northern end of the harbour : abundance of geese, ducks, swans, and partridges may be shot near Rocha lagoon about 5 miles inland.

Paloma (Arecife) road lies to the northward of Paloma islet and harbour, and affords anchorage in 5 fathoms, well sheltered from north-west and south-west winds, about three-quarters of a mile off shore. The bottom is very uneven, in approaching from the northward.

* The existence of these banks is considered doubtful.

A bank with 2½ fathoms on its extremity, which occasionally breaks, extends 1¼ mile N.N.E. of Paloma island, and is one mile distant from the shore; it must be avoided in making the anchorage.

CAUTION.—Although cape Castillo could be recognized at a distance by the round white sand-hill of Buena Vista (184 feet), and, rising up in advance of it, the steep black islet Castillo Grande (102 feet), with cape Polonio about 3 miles to the southward, it was often mistaken for cape Santa Maria, which has the appearance of undulating sand-hills, varying from 50 to 80 feet in height. Since the erection of lighthouses on capes Polonio and Santa Maria, this mistake should not occur. In heavy weather, if the land cannot be made out, do not shoal into less than 15 fathoms, as there are depths of 12 fathoms close to Polonio rock.

The COAST from cape Santa Maria extends westward for 6 miles to Rocha lagoon, thence south-westerly for 21 miles to San Jose Ignacio or Piedras point. It is a sand beach similar to that to the eastward; not a rock nor a single remarkable object exists on this uniform coast. A few farm-houses, surrounded by a few trees, are dotted on the summits of the sandy downs which rise from 60 to 130 feet above the sea, and gaps in these sand-hills indicate the presence of the lagoons Rocha, Cardal, Garcia, Blanca, &c. This coast is clear of danger, and at the distance of three-quarters of a mile from the shore there are from 6 to 11 fathoms water.

SAN JOSE IGNACIO, or Punta Piedras point, so named on account of the lagoon of this name in the vicinity, will be recognized by the lighthouse. It may also be known from the offing by two large farm-houses, one situated 2 miles to the north-west, the other 6 miles to the north-east. The point is formed by a frontage of rocks two-thirds of a mile in extent east and west, divided by a small sandy beach; reefs surround the point, forming within creeks where boats may land.

At one mile south of the cape there is a ledge of rocks with depths of from 5½ to 8 fathoms.

LIGHT.—From a lighthouse on San Jose Ignacio point, at an elevation of 103 feet above the sea, is exhibited a *fixed* white light,* visible in clear weather from a distance of 15 miles.

This lighthouse is reported to have two narrow white bands around the upper part, and one around the lower part.

* Intended to be altered to a red light.

San Jose Ignacio lagoon falls into the sea to the westward of the point of that name ; this lagoon is about 8 miles long in a northerly direction, by an average breadth of 3 miles, and is said to be deep. The sandy beach recommences to the westward of San Jose point, interrupted by some rocks, 11 miles W.S.W. of the point, near the mouth of the Maldonado rivulet; these rocks form a slight projection named Maldonado point. Between this latter point and that of San Jose Ignacio, the coast forms a slight bay, but westward of Maldonado point the coast has some scattered rocks.

PUNTA del ESTE,* or EAST POINT, which is considered the north entrance point of the La Plata, forms the eastern part of Maldonado bay. It is a small dark headland, about 50 feet high, at the end of some sandy downs, with a lighthouse on its summit. Isolated banks extend off about 2 miles to the south-westward. From the offing, in fine weather, the summits of the mountains Pan de Azucar and Sierra de las Animas may be seen in the north-west, 8 or 10 miles before seeing Punta del Este.

LIGHT.—On the highest part of Punta del Este, at a quarter of a mile from its extremity, is a white tower 90 feet high, from which is exhibited, at a height of 152 feet above the sea, an intermittent white light, visible *ninety* seconds and eclipsed *twenty-five* seconds, and should be seen in clear weather from a distance of 15 miles.

Within 5 miles the eclipses are not total. At the distance of 9 miles from Lobos island, and at the height of 23 feet above the sea, the light is shut out by the summit of the island on a N.W. ½ W. bearing.

LOBOS ISLE,† situated 4 miles south-east of East point, is flat, rugged, 65 feet above the sea, and may be seen from a distance of 12 to 15 miles. It is usually visible a little sooner than East point; its coast is rocky, and can only be approached by a sandy creek on the north side of the isle, near the eastern huts of the seal hunters. Off the north end of Lobos for the distance of 3 cables, the bottom is uneven with several rocky heads of 3 fathoms. The west side of Lobos is steep-to, and there are depths of 6 fathoms at less than 2 cables from the beach; but on the east side is a detached reef which extends E. ½ S. nearly one mile from the shore. The crown of the reef is formed of two large rocks always uncovered ; between the reef and the isle there is a depth of from 3 to 7 fathoms water.

Between Lobos and the main there is a channel 4 miles wide, with

* *See* Admiralty plan :—Maldonado bay, No. 548, scale, $m = 3{\cdot}0$ inches.

† *See* Admiralty plan :—Lobos isle, scale $m = 1{\cdot}4$ inches, on chart No. 2544.

a depth of 10 to 15 fathoms, mud, with sand and mud; this channel, however, had better be avoided in light winds with a swell, as the currents are stronger than in the offing. Lobos, as its name denotes, abounds in seals; they live chiefly on the rocks on the east and north side; in the interior of the isle there is an abundance of rabbits.

Doze shoal, on which depths of 4¼ to 6½ fathoms were obtained, is reported to be situated with the south-eastern point of Lobos isle, bearing N. 29° W., distant about 2 miles, but neither the exact position, nor the extent of the shoal, could be ascertained on account of bad weather. Position, approximate, lat. 35° 3½′ S., long. 54° 52′ W.

Captain Le Nepvou de Carfort, French vessel-of-war *Etoile* (1890), examined the locality with the following result that, soundings of 17 to 18 fathoms were obtained, southward, south-eastward, and eastward of Lobos isle, on and around the reported position of the shoal.

H.M.S. *Caroline* when standing towards Lobos isle from the southward, gradually shoaled the water from 14 to 7 fathoms over hard sand, in the (approximate) position, lat. 35° 13′ S., long. 54° 53½′ W.; the heavy sea prevailing at the time, together with the indistinctness of the land, prevented a detailed examination being made.

Prolonged search subsequently made by several of H.M. Ships has failed to find the above shallow water reported by H.M.S. *Caroline.*

Stork knoll.—A small patch of 6 fathoms, with 10 to 13 fathoms around, reported by H.M.S. *Stork*, lies with the following bearings:—Centre of Lobos isle, N. 50° E., Punta del Este lighthouse, North. Position, lat. 35° 4′ S., long. 54° 58′ W.

It is to be remarked that the *Stork*, returning to this spot to make a further examination, was unable to find her own knoll, which is not very surprising seeing that it is probably of small extent, and that there is some difficulty in accurately fixing the position of a ship in this locality, at some distance from the land, with a few objects.

Ready shoal.—A depth of 6 fathoms, with 15 fathoms close around, reported by H.M.S. *Ready* on the spot formerly marked on the chart as 9 fathoms, lies with Lobos isle bearing N. 78° E., distant 7 miles. This shoal appeared to be circular in shape and about 2 cables in diameter. Position, lat. 35° 2′ S., long. 55° 2′ W.

Ruby patch.—A patch of 6 fathoms, rock, was passed over by H.M.S. *Ruby*, when proceeding from Maldonado to verify the *Ready's* soundings. Possibly less water may exist. It lies with Lobos isle, bearing East, distant 5 miles. Position, 35° 0¾′ S., long. 54° 59¼′ W.

Caution.—As accumulated evidence points to the possibility of the existence of other small knolls at the entrance of the Rio de la Plata, the Mariner should use every precaution in navigating this vicinity, and especially keep his lead going.

Pilots for the river Plate cruize off Lobos, and it is advisable to employ their services. *See* page 220.

ASPECT.—Before continuing the description of the inner shores of the La Plata it will be necessary to describe the hills and mountains in the interior that are visible from the offing in clear weather, as they may prove useful in making the land. In approaching on the parallel of 33° 45′ S., at 10 miles off shore may be seen in the west the Sierra del Carbonero, a range of hills 4½ miles long in a north-east and south-west direction, the centre being the highest; it lies inland 9½ miles from the shore, and is on the frontier line between Brazil and Uruguay. On one of the slopes of the hills the fort of San Miguel is very conspicuous.

Cerro de los Difuntos, situated 25 miles south of the Carbonero range, is composed of several summits of about the same height, at 6 miles from the shore on the west side of a lagoon. Seen in the north-west this cerro presents a remarkable gap or ravine. At 5 miles westward is the bare conical hill of Cerro de Navarro, rising from the centre of a group of smaller hills. On advancing south-westward the rounded sand-hill of Buena Vista close to cape Castillo, already described, will be visible.

Cerro Chafalote.—This mountain range is much higher than those just described, and is 19 miles westward of cape Castillo. It is easily recognised by its isolation in the midst of the plain, its greater size, and its outline, which seen from the eastward presents three summits of which the centre is the highest. This group of landmarks renders cape Castillo a preferable landfall to cape Santa Maria.

Silla Chica is a small saddle-shaped hill at 13 miles inland; and Silla Grande, a similarly shaped hill, lying 5 miles westward of the

former, is rather more elevated; their form is more remarkable when seen bearing about north.

Morro san Ignacio is a lofty summit, 19 miles northward of San Jose Ignacio point. Los Tres Cerros, to the south-westward, is a hill with three summits, the westernmost being the highest, and it is easily distinguished from the offing.

Sierra de la Ballena is another range of rocky blackish hills, extending in a nearly north direction from Ballena point, the western extreme of Maldonado bay. A large patch of white sand on the south slope of one of the hills, 2½ miles from the point, may be seen from a long distance seaward.

Pan de Azucar.—To the northward of punta Negra, or Black point, is a mass of mountains, of which the culminating points, the Pan de Azucar and the Sierra de las Animas, are the highest summits of all the coast; they may be seen in fine weather at a distance of about 40 miles, and are consequently of great utility when a vessel makes the land in the parallel of, or to the south-east of Lobos islet. Pan de Azucar is a nearly regular cone, 1,230 feet high, at 3 miles from the beach.

Sierra de las Animas lies 5 miles north-west of Pan de Azucar, and is 1,610 feet high, but its summit is flattened, and has a slight depression in the form of a saddle, visible when seen bearing about W.N.W.

We now return to the description of the coast from Punta del Este.

MALDONADO BAY, 5½ miles wide by nearly 2 miles deep, is formed between East point and Ballena point. It is exposed to south-west winds, which cause much sea, but a portion of the bay is sheltered by the small island of Gorriti. On the beach north of Gorriti is an iron pier, and on the beach east of the island is a wooden pier; but neither of these piers afford landing from boats unless a temporary ladder is secured to them. Inside East point is a small sandy cove, the only place at which supplies can be shipped when the surf is on the beach after south-west winds.

The shores of the bay are clean with the exception of Arecife or Granite point, 2 miles westward of the iron pier, which is rocky.

Thence to a spot east of the north end of Gorriti, the shore is backed by sandy hills and ridges, 20 to 90 feet high. Between the south end of the sand-hills and the long flat hill 50 feet high, which forms the promontory of East point is a low sandy isthmus. The sand-hill which is situated just to the north of the isthmus is well defined, and useful as a mark for the anchorage.

The small town of Maldonado which gives its name to the bay, stands half a mile from the beach a little beyond the brow of a hill, about 100 feet high, so that its locality is only indicated from seaward by a few trees, the tops of the church and of the higher houses, and by a small tower 60 feet high, which is of a dull red colour, and stands on the summit of the ridge. A low, square, white house is also visible to the west-north-west of the tower. In the north-east part of the town there is a large white church, which forms a useful mark. The population of Maldonado has much diminished during late years; at present scarcely a fourth part of the number of houses are inhabited. San Carlos, a town of about the same size, is 7 miles farther inland.

Gorriti island, which gives shelter to the anchorage, is nearly a mile in length north and south, and about 3 cables broad. It is low, of sand and rock, and has a small bay and beach on its west side. Some small batteries, and a storehouse for the produce of the seal fishery, existed here in the beginning of the century, but are now in ruins. North of these ruins there is an iron cable tank painted red. A rocky ledge extends a cable off its north-west end; and extending 3 cables from its north-east end there is a sandy spit, with a depth of 1¾ fathoms on its extremity, and must be carefully avoided.

Punta del Este bank.—At nearly half a mile W. by S. from East point is the outer edge of a reef of rocks about 2 cables in diameter, with a rock awash at low water, on which the sea always breaks.

New, or Parker, rock, about 1½ cables in extent, with 4 fathoms water on it, lies W. by S. ½ S. distant one mile from East point, and South 8 cables from the south point of Gorriti island. The south extreme of East point, bearing N.E. by E. ½ E., leads southward of New rock; and Maldonado tower, over the south-west side of Gorotti, bearing N. ½ E., leads to the westward. The bottom near New rock is rocky and uneven, and the depth varies from 7 to 12 fathoms.

Sylvia bank.—This bank with a depth of 5 fathoms, least water found, is about 3 cables in extent within the depth of 10 fathoms. Its shoalest part lies with East point bearing N.E. distant 2 miles.

Mostyn rock lies about a quarter of a mile East of the ruins, which are situated on the south-east side of Gorriti; the rock is 2 cables in extent, has 9 feet least water; though not in the direct track of vessels entering, it might pick up a vessel at night, and too near the island.

The Monarch is a small rocky patch with 2¾ fathoms water on it; there are 4½ and 5 fathoms close to and round the rock within the distance of a cable. The shoal spot lies 6 cables W.N.W. of the north-west point of Gorriti, leaving between a channel 3 cables in breadth with 6½ fathoms water. The leading mark through this channel is the old cemetery which stands half-way between Maldonado tower and the beach, bearing N. by E. The cemetery has two domes, but as they are not kept white, they are not conspicuous. If the western one can be discerned and brought in line with the iron pier, bearing N. by E. ¼ E., it will lead between Monarch rock and Gorriti island; but care must be taken not to use the eastern dome, as in that case the vessel would pass close to the rock.

To the westward of the Monarch there are no dangers, but a vessel should not shoal less than 6 fathoms. Maldonado tower over the iron pier, N.E. by N., leads 2 cables westward of it; and Pan de Azucar over a small low saddle immediately within Ballena point W.N.W., leads on it; but kept open the apparent breadth of the Pan de Azucar either way, clears it north and south. The hut near the iron pier in line with the square white house west of Maldonado tower, and bearing N.N.E., leads directly on Monarch rock.

Tides.—There are no appreciable tides in Maldonado bay; strong southerly and south-east winds raise the water 6 feet, and the opposite winds depress it. Westerly winds cause a strong current to set round Gorriti to the east and south.

Anchorage.—Vessels may anchor in safety in 4½ to 5 fathoms, sand over very stiff mud, with the north-west end of Gorriti island from S. by W. to S.W., and Ballena point about W. by N. There is also anchorage sheltered from all winds but those from the S.W. (which are the most dangerous here) eastward of Gorriti, in 5 or 6 fathoms, muddy bottom, but care should be taken to avoid Mostyn rock already mentioned.

The ledge off the north-west end of Gorriti will shelter a vessel from south winds, which occasionally blow very strong. If a vessel intends making any stay it is necessary to moor, as the anchor soon

becomes foul; moor open hawse to the south-west; the holding ground is very good, the anchor requiring a great purchase to lift it.

Pilots.—A pilot resides at East point, and is a general pilot to Buenos Aires, &c. Pilot cutters are also frequently off this bay, having pilots on board, both for Buenos Aires and Monte Video.

Supplies.—Water may be obtained from a small running stream, about 150 yards eastward of the iron pier. Moor the boats close to the beach, and lead hoses off from the watering engines. The lower part of the water when it reaches the beach is brackish, but between the banks it is excellent; by sinking a tub to put the hose in, and having about 200 feet of canvas hose, and about 120 of leather to lead through the water, 20 tons may be obtained in a day.

There is generally a little surf on the beach, and after a south-west wind, for two or three days there is no landing on it, but during the summer, water may, on an average, be obtained five days in a week. There is also a lake of good fresh water at 2 miles westward of the pier within 50 yards of the sea, where a vessel could anchor in fine weather for the purpose, but no vessel should remain there longer than is actually necessary, as the bottom is sand, and the swell comes in heavily with south-west winds. Fresh beef and vegetables may be procured at very moderate prices. Live stock is reasonable, and cheaper than at Monte Video. Plenty of fish may be caught in the bay.

Directions.—A vessel bound into Maldonado bay may pass on either side of Lobos isle, avoiding the reef extending from its east side. East point will be known by the lighthouse. If southward of Lobos isle, the town and tower of Maldonado will be seen, and probably Pan de Azucar, and Sierra de las Animas north-west of it. Having passed the isle, East point should not be brought to bear eastward of N.E. by E. ½ E., and when Maldonado tower is open of the south-west side of Gorriti island, bearing N. ½ E. haul up for either channel, keeping Pan de Azucar open of Ballena point.

When Maldonado tower is in line with the iron pier bearing N.E. by N., a vessel may haul in for the passage westward of Monarch shoal, until Pan de Azucar shows northward of the saddle on Ballena point; then steer for the anchorage: or the western dome of the old cemetery in line with the iron pier N. by E. ¼ E. will lead between Monarch rock and Gorriti island in 7 fathoms water. With the wind at S.E. by E. a vessel may fetch the anchorage by passing

east of the Monarch, but a tack must be made if westward of it. Do not approach the iron pier nearer than a third of a mile.

In rounding Gorriti island at night from the eastward, a stranger is liable to mistake the south-west end of the island for the north-west, as the sandy bay between them is very low and not easily discerned in the moonlight or darkness.

Ballena point is bold, and may be passed at a prudent distance. In working into the bay from the westward, a vessel may stand into 6 fathoms water, at the distance of a long half mile from the shore; and in approaching the Monarch, keep Pan de Azucar northward of the saddle on Ballena point.

South-east channel.—Between the north-east end of Gorriti and the main the ground is uneven, but there is a channel about a cable in breadth carrying 4 fathoms water, which in fine weather may be used by small vessels having local knowledge, as no direct marks can be given. In fresh southerly winds the sea breaks right across. Pilot cutters and small coasters sometimes pass between East point and the reef west of it, but the current here runs strong, and renders the vessels almost unmanageable in a moderate breeze.

Strangers in boats should be careful not to get set amongst the breakers of the reef, as they are treacherous in the finest weather.

POTRERO BAY, between Ballena point, and Raza point, at 9 miles west of it takes its name from an adjacent lagoon, which has its outlet in the bay. Potrero bay is clear, and affords anchorage with off-shore winds in 5 to 6 fathoms, gravel bottom, at 2 miles from the beach. The white sandy beach in the bay forms a good mark for this part of the coast.

Punta Negra, or Black point, which presents an east and west headland or frontage 2½ miles in extent, is formed by three rocky points, separated by two small sandy bays. The eastern point is named Raza, the centre Negra, and the western Iman; they are all steep, and are over-looked by the high grounds which are connected with Pan de Azucar. The depths about one mile off this headland range from 7 to 10 fathoms. From Iman point, the shore trends in a northerly direction 3 miles to English point; the small bay which lies between is named Puerto Ingles. Animas point situated 5 miles west of English point, is low, and has a reef of rocks extending some distance from it.

Punta de Afila lies 7 miles westward of Animas point, with a clean sandy beach between. Two hills near the point, higher than the rest, are conspicuous from the offing; on the northern was formerly a look-out station, whence the arrival of vessels was signalized to Monte Video. The slope of the southern hill forms Piedras Negras point, which is low; and bordered by steep rocks. The surf is heavy on this coast.

Afila and Solis rocks.—Afila rocks, cover at high tides. They are about one mile in extent and lie 1½ miles south of Punta de Afila.

Solis rock, 3¼ miles east-south-eastward of Afila rocks, and the same distance from Animas point, is about 3 cables in extent; it is covered at high tides, and the sea breaks on it constantly. There is a depth of 3 fathoms, sand and mud, between Solis rock and the shore. From the centre of this rock Pan de Azucar bears E. by N. ¼ N., and Sierra de las Animas N.E.

PIEDRAS NEGRAS,* the next salient point, lies about W. ¾ S. 9½ miles from Afila point; the sandy beach between is broken by a rocky point named Pedro Lopez, and the Solis Chico rivulet falls into the sea about 2 miles westward of it. A rocky shoal encircles Piedras Negras point, and extends about three-quarters of a mile off shore.

La Playa de Santa Rosa, an extensive gravel beach, lies between Piedras Negras and Carretas or Buceo point, a distance of 19 miles; it is clean and steep-to, with 3 fathoms near the shore. The sea is very heavy along this coast in all winds between south and east, and the strong currents which then prevail would drive a ship bodily ashore. Several vessels have been lost here, and their crews have perished, not from rocks, but from the heavy surf that breaks on the steep shore.

Close to the westward of Piedras Negras point, is the small bay of Santa Rosa, about 1¼ miles across, with a depth of 3 to 4 fathoms, mud; a small stream of fresh water runs into it, and the beach is of hard sand, and steep. At 6 miles farther to the west, Pando rivulet falls into the sea; with the town of the same name on the right bank of the stream, 6 miles inland.

CARRETAS or BUCEO POINT is low, rocky, and backed by a large hill, which has obtained for it also the name of Punta Gorda.

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* *See* Admiralty chart:—Piedras Negras point to Santa Lucia river, showing the approaches to Monte Video, No. 493, scale, m=0·6 of an inch.

This serves as a mark to recognise the point. A small islet named Luz, about 5 feet high, surrounded by rocky and uneven ground a quarter of a mile distant on all sides, lies S.E. distant 4 cables from Carretas point.

Carretas or Pipas rocks, a cluster about 10 feet above water, lie with their western extremity 1¾ miles E. ¼ S. from Carretas point, and extend thence 4 cables in an easterly direction. The eastern rock (Mark rock) is distant 5¼ miles W. by N. ¾ N. from Flores island lighthouse, and is visible about 3 miles, showing dark against the white beach. Rocks awash extend about 2 cables east and north of Mark rock, and broken ground of from one to 2 fathoms extends 3½ cables northward of Carretas rocks.

Bump shoal, of 4 feet, lies 4 cables E. by S. ½ S. from Mark rock, with a depth of 4 fathoms mud between. This shoal rarely breaks and is therefore more dangerous.

Sara bank, with 9 feet of water over its shoalest part and 4 fathoms at a short distance, is about 4 cables long, and lies one mile S.E. by S. from Mark rock, and 4⅓ miles W. by N. from Flores island lighthouse.

Forest King reef, with 6 feet water, is 5 cables long, in a north-west and south-east direction, and 1½ cables broad. From the southern extremity of the reef, Mark rock bears N.E. ½ E., Luz islet N.W., and Flores island lighthouse E. ½ S. 6 miles. The reef is steep to, 3¾ fathoms, mud, being found within a cable of the rocks.

Directions.—In working out of the river, Flores island light should not be brought to bear southward of east until two remarkable single trees resembling oaks, about 3 miles to the north-eastward of the entrance of Toledo river, are in line, bearing N. ¾ W.; this latter mark leads eastward of the shoals off Carretas point. The northern tree stands on the top of a low conspicuous range of hills. The southern is below the hill, but shows clearly by reason of its dark foliage.

FLORES ISLAND,* at 7½ miles E. by S. ¼ S. of Carretas point, is a good landfall, and one always made; it lies 51 miles W. ¼ S. from Lobos. The islands or islets are a mile in extent, in a north-east and south-west direction. The north-east portion, 42 feet high and about

* *See* Admiralty plan :—Flores island, No. 596, scale, *m*=8 inches.

2 cables long, is connected at low water with the south-west portion, distant 2 cables, by a ledge of rocks.

The island is in telegraphic communication with Monte Video, and is used as a quarantine station for vessels frequenting that port. The lazaretto is on the west side of the island, where also there is a pier, and a mooring buoy in 3 fathoms, half a cable off the pier. Shoal ground extends one mile northward of the north east extremity of the island; also half a mile westward of the lighthouse.

Cumberland shoal, with a least depth of 3 fathoms, lies S.W. by W. ½ W., distant 5⅛ cables from the lighthouse. Depths of 3½ and 4 fathoms, extend one cable northward, and 3 cables southward of the shoal; and there is 5 fathoms between it and the island.

Puno shoal.—From the north-east point of the islands a ledge of rocks extends about half a mile: northward of which, and isolated, is Puno shoal, nearly half a mile in extent north and south. From its shoalest spot of 1¾ fathoms, the north-east point of the islands bears South, distant three-quarters of a mile.

Anchorage.—There is anchorage in 4¼ fathoms, mud, about 3 cables north of the landing pier; also all round the islands.

LIGHT.—On the south-west extremity of Flores island, from a white lighthouse, 65 feet in height, is exhibited at an elevation of 106 feet above the sea, a *revolving* white light *every minute*, and should be seen 12 miles in clear weather.

BASSURAS BAY, formed between Carretas and Brava points, is 5 miles in extent and one mile deep. Near the middle of the bay is the small islet of Meldroza, between which and the main is an anchorage for small coasters.

Buen-Viaje reef is nearly circular, and about half a mile in diameter. From its east end, Brava point bears W. by S. ½ S., 1¾ miles. The shoal is marked by three buoys, namely a bell buoy on the eastern extremity in 4 fathoms; a buoy on the north-eastern extremity in 4 fathoms; and a buoy on the western extremity in 3½ fathoms.

CAUTION.—The navigator is recommended to approach this part of the coast with caution, as it has not been thoroughly surveyed.

PUNTA BRAVA, at 2 miles eastward of Monte Video, is a low point projecting half a mile from the main, with a lighthouse on it, one cable from its extremity. A reef extends about 1½ cables south-

west of the point; at its extremity is a detached rock awash, and one cable beyond there is a depth of 4 fathoms, mud.

Vessels may round punta Brava at one mile distant, avoiding a bank of 2½ fathoms (supposed to have been formed by a wreck), reported to lie 2½ miles S.S.W. of the point.

LIGHT.—From the white lighthouse on punta Brava, at an elevation of 70 feet above the sea, is exhibited a *fixed* white light, visible in clear weather from a distance of 10 miles.

Punta Sarandi is 3 miles W.N.W. of punta Brava, and forms the western extremity of the peninsula of Monte Video. The coast between is rocky, and forms a bay three-quarters of a mile deep; in the middle of this bay is a sandy cove, named Playa Ramires. The west points of the cove, named Perez, and Gabriel inside of it, have rocks extending a short distance off.

MONTE VIDEO BAY* is open to the south-west, and is in the form of a horse-shoe. Between puntas San Jose and Lobos, the entrance points, it is 2 miles across, and the same distance in depth. It is sheltered from winds between West round northerly to S.E. The eastern shore of the bay is the sea wall of the Central railway, northward it is composed of sandy beaches and rocky points; the western shore, at the foot of the Cerro, is rocky. The bottom all over is of soft mud, with a few patches of rock; the depth varies from 15 to 10 feet; the bay, therefore, only admits vessels of comparatively small draught of water.

The harbour, or inner anchorage, is close off the north-west face of the town, where there is from 9 to 15 feet water. The anchorage here is indifferent, as there is much sea during strong southerly winds. Vessels are recommended to moor, in all cases. The breakwater, which extends about 160 yards in a N.W. ½ W. direction from San Jose point, being covered, except at low water, affords no shelter to the landing-place during a pampero, and but little protection at any time. A buoy marks the extremity of it. A pole buoy in 10 feet marks the north-west extremity of the shoal water, northward of punta Sarandi, with San Jose point bearing E. by N. ¾ N. distant 2 cables.

STORM SIGNALS.—On the approach of storms or bad weather, by day, a red and white flag will be hoisted under the national flag; at night a *red* light will be shown in place of the flag.

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* *See* Admiralty plan :—Monte Video bay, No. 2,001, scale, m = 5 inches.

Islets, Rocks.—On the east side of the bay, at half a mile north of the town, and the same distance west of the sea wall, is a group of rocks named Familia, marked by the boiler of a wrecked steamer, above water. Rat islet to the north-west was formerly fortified, but the buildings are now in ruins. A patch of rock awash at low water, about a cable in extent, lies 3 cables to the north of Rat island, and a rock, having 6 feet water over it, lies 3 cables to the eastward of Rat island.

Sarina rock, awash in very low water, lies 3½ cables S.S.E. ½ E. from Rat island. It is marked by a black perch.

Triton shoal, of 7 feet, lies a good cable to the eastward of Sarina.

Tagus rock, with a depth of 15 feet, lies with El Cerro lighthouse bearing N.N.W., and the cathedral N.E. by E. ½ E.

Wrecks.—A dangerous sunken wreck, with mast just showing at half tide, lies 4 cables E. ½ S. from Tagus rock, and is marked by two black *conical* buoys placed north-west and south-east of it, also by a hulk moored about 2 cables north-east of it, from which is exhibited *white* light above a faint *red* light.

The wreck of the German steam vessel *Corrientes*, with mast showing at low water, lies half a cable S.S.E. from Tagus rock, and is marked by a black *spherical* buoy attached to it.

El Cerro (the Mount) rises on the western side of the bay in the form of a bare cone to a height of 465 feet, at less than three-quarters of a mile from the beach. It is crowned by a fort, on which there is a lighthouse. The Cerro is useful on all occasions, whether on a voyage up or down the river, as a conspicuous and easily recognised landmark, and by careful observations it will very materially assist in ascertaining the direction and force of the currents, which are so variable and uncertain.

Lobos point, the south extreme of El Cerro, has rocks off it to the distance of 4 cables, known as the White rocks. There is a depth of 15 feet only, at half a mile southward from the point.

SAN FELIPE de MONTE VIDEO, the capital of the Oriental Repulic of Uruguay, or Banda Oriental, stands on a gently rising ground on the east side of the bay, occupying a peninsula, extending east and west 1¼ miles, by half a mile in breadth. The warehouses,

the wharves, and the lofty custom-house buildings produce a favourable impression on landing. The principal building is the cathedral, an imposing structure, with its dome and two towers, which may be seen from a long distance in the offing.

A British Minister, who is also Consul General, and consuls of all nations reside here, and there is an English church on the south side of the town near the shore; the building is open also to other Protestant denominations. The trade of Monte Video is considerable; the exports consist principally of wool, hides, and tallow; and the imports of cotton and woollen fabrics, hardware, wine, &c. A large transit trade is done in provisions. In the year 1882 the value of the exports amounted to 4,304,152*l.*, and the imports to 3,812,529*l.*, one-fourth of the total trade being with Great Britain. The population of the city and the immediate neighbourhood in 1882 was 120,000; about one-fourth of the Republic.

Communication.—Monte Video is intersected with tramways, and is in telegraphic communication with all parts of Brazil, and by submarine cable with Europe.

There is almost daily communication by river steamers with Buenos Aires. The English lines of steamers calling, are the Royal Mail; Liverpool Brazil and Plate Co.; and Pacific S. N. Co.; passage from England occupying from 23 to 30 days.

Docks.—In Monte Video bay there are two graving docks, namely, Mana dock in the eastern part of the bay; and Cibil dock, near Lobos point.

The dimensions of Mana dock are as follows:—Length 271 feet, width at entrance 52 feet. The water is occasionally as high as 18 feet on the sill, and as low as 11 feet. The dock is cut out of the solid rock, and the entrance is closed by a caisson. As the entrance is much exposed, the sea is liable to break over the wall during gales.

Cibil dock has a total length of 450 feet, width of entrance 55 feet, and depth on sill at ordinary high water 18 feet.

The dock can be divided into two sections; the first section is 255 feet in length, and the second section 195 feet.

Care is necessary when approaching this dock, especially by the southern channel, which has some rocks near the entrance. Vessels of over 17 feet draught should not attempt to enter or leave the dock until 19½ feet shows on the tide pole at the dock entrance.

The southern channel is deeper than the northern, but the bottom is hard, and the current sets across it from the southward, especially with southerly winds. Two poles with circular discs, at the dockyard, kept in line lead up the channel.

In the northern channel the bottom is soft mud; this channel is to be preferred when leaving the dock, particularly with southerly winds. There are no marks in the dockyard for this channel, but the buoys marking it are sufficient for navigation.

A rock with less than 6 feet water, lies with Cibil dock chimney bearing W. ½ N. $2\frac{9}{10}$ cables, and south-eastern White rock S.W. ¼ S. At $1\frac{4}{10}$ cables S.W. by W. from this rock lies another rock having on it 8 feet water, with Cibil dock chimney bearing N.W. by W. ¼ W. Between these rocks the ground is generally foul, with depths of as little as 4 to 6 feet rocky bottom in places.

Before entering the dock, it would be prudent to sound the approaches, as the depths may vary from time to time.

Supplies.—Water is brought by pipes, from the river San Lucci, distant 33 miles, to a reservoir, 6 miles distant from the town, and from thence to the capital. Water is brought off to the vessels when required. Supplies are cheap and abundant. Several small streams run down the slope of the Cerro.

Coal.—About 10,000 tons of coal are usually kept in stock at Monte Video. There are more than 20 lighters and 5 tugs, by which means coal may be put on board at the rate of 400 tons per day, or 700 tons if working also at night. Bad weather, not infrequent during the winter months, interrupts coaling.

LIGHTS.—A *fixed* and *flashing* light showing a flash *every three minutes* which lasts for 15 seconds is exhibited from a brown tower within the fort on the summit of the Cerro, at an elevation of 486 feet above the sea, and should be visible in clear weather from a distance of 25 miles. The flash of 15 seconds is preceded and followed by a short eclipse. This light, on account, perhaps, of its great height, is not to be depended upon, and is reported to flash irregularly.

A white light is also shown at 147 feet above the sea by the dial-plate of the clock in the south-east tower of the cathedral. This light is intended to enable vessels to anchor in the outer road at night, by cross bearings of the two lights, but though higher than the lights of the town, it is not brighter, and is difficult to distinguish.

Two electric lights are exhibited in the town of Monte Video, and may be visible for a distance of 25 miles seaward, these lights, however, may not be constantly exhibited.

The anchorage for vessels of moderate draught in the road at Monte Video is about 1½ miles S.S.W. of San Jose point, in 20 or 21 feet, mud, with the Cerro bearing about N.W. ½ N., the cathedral N.E. or N.E. by N.; and Brava lighthouse East. Vessels may anchor farther in as convenient, and those of light draught in the inner anchorage, or northward of the town in 9 to 12 feet, mud. In the inner anchorage, on the east side, vessels frequently drag their anchors during bad weather; the holding ground is much better nearer the Cerro. The anchorage near Sarandi point is not safe, on account of the heavy ground swell in that locality, and in case of a pampero the vessel would be on a lee shore.

Vessels with good anchors and cables may anchor safely in the road of Monte Video in the same depth of water as they draw, provided the river is at a mean height, for, whenever the wind sets in from the southward, the water rises sufficiently, and the bottom being so very soft, 3 feet more than the vessel's draught is amply sufficient to ride out the heaviest gale without injury.

Vessels should moor, with open hawse to the south-west, being the quarter from which the pampero blows strongest. One great evil is the generally crowded state of the small harbour, rendering it difficult to get under way without fouling some other vessel; and even then it is necessary to be towed up towards the Cerro before making sail, by which a steady breeze is gained.

In approaching from the eastward, and unable to reach Monte Video bay before dark, a vessel can anchor south-eastward of the Cerro light in 3½ or 4 fathoms of water, and be in readiness to take up a berth when convenient. The bottom near the shore eastward of Monte Video is bad holding ground.

Tides.—It is high water, full and change, at 2h. 30m. (approx.); astronomical tides range about 18 inches. The level of the water rises from the effects of wind, ordinarily 4 to 6 feet, occasionally 8 feet; rising with east, south-east, and south-west winds, and falling with those from the opposite quarters. The water is sometimes considerably higher at the town than on the opposite side of the bay, and vice versâ; there is also a less rise of river noticeable at Monte Video than farther out in the estuary.

An inshore stream runs round Monte Video bay often in the opposite direction to the main stream of the river, and the water forced into the bay by the first part of a strong south-westerly wind is heaped up, and rushes out, three or four hours after the wind has commenced to blow, as a counter current round San Jose point, causing vessels to ride across the wind, to roll much, and frequently to part their cables and go on shore. The bottom, however, is so soft that they get off again without damage to the hull. See remarks on currents at page 274.

Great care is necessary in standing out from the eastern side of the bay after a pampero has been blowing, as a strong north-west current is often experienced directly Sarandi point is cleared.

ESPINILLO POINT, at 10 miles westward of Monte Video, is the southern limit of the embouchure of Santa Lucia river. There are some remarkable white patches on the rise of the point. Its extreme is low and rocky, and shoal water, with large isolated boulders, extends three-quarters of a mile to the westward, with 3 to 3½ fathoms close to. Vessels should not approach Espinillo point within a mile, as the currents are uncertain. H.M.S. *Dart*, in 1872, grazed a shoal of 12 feet depth lying about 2¼ miles W. by S. from Espinillo point.

LA PANELA, a dangerous reef of rocks, 3 cables in extent, and about 3 feet of water over it, lies South distant 5 miles from Espinillo point; and W. by S. ¾ S. from the cerro of Monte Video (position approximate). With a low river, the rocks have been seen above water.

The lead gives no warning of approach to the Panela; all around there is a depth of 3½ and 4 fathoms, mud. A vessel in the vicinity of the reef by day in clear weather, and the light vessel not in place, should keep the Cerro lighthouse northward of an E.N.E. bearing until the westernmost white patch on Espinillo point bears eastward of N. by E. ½ E. To pass between Panela reef and Santa Lucia bank, keep the cathedral entirely masked, or the Cerro lighthouse to bear a little eastward of E. by N.

LIGHT VESSEL.—A light vessel, with three masts, and painted white, is moored about one cable N.N.W. from the shoalest part of Panela reef, and exhibits a *fixed* white light, 17 feet above the sea, visible 5 miles. The light vessel is frequently out of position after bad weather.

Santa Lucia River has its outlet between Espinillo and Tigre points. Its entrance is divided into two passages by Tigre islet, and is encumbered by banks; coasters only can enter.

At the entrance of Santa Lucia river there is a rock awash, marked by a buoy. The holding ground off the river is good.

Santa Lucia bank is a sandy flat thrown out by the river; it is ill-defined, but its southern extremity, of 3 fathoms, appears to extend 7½ miles from the shore, and about the same distance from Espinillo point.

The COAST westward of Santa Lucia river is a sandy cliff or Barranca, from 70 to 100 feet in height, extending 22 miles in a westerly direction, as far as Santa Maria or San Gregorio, a dark bluff point, about 100 feet in height, with two or three houses on its summit. This cliff is known as the Rincon de Alcibar. From Santa Maria point, the coast to the westward is much lower, and composed of sandy downs from 20 to 30 feet high for 4 miles, as far as Sandy point, which is low.

Between these two points a small curved sandy spit, having depths of 8 to 12 feet, extends 3 miles off shore; and at 7 miles south-eastward of Santa Maria, about 4 miles off the river San Gregorio, is said to be a shoal spot of 12 feet. Vessels often complete water from alongside in this vicinity; it is generally as good as that obtained farther up. Fish may be obtained by hauling the seine in the bay between Santa Maria and Sandy points; and numerous deer, partridges, and wild duck may be shot in the vicinity.

North-westward of Sandy point, a sandy beach continues, with downs at the back from 30 to 90 feet high, as far as the outlet of the rivers Pereyra and Payon; it offers few remarkable features, except some groups of trees which are seen from the offing, one near the outlet of the Payon, the other half-way towards Sandy point. The entrance to the river San Miguel, 2 miles north-west of Sandy point, is conspicuous at the distance of 6 or 8 miles; the dark brushwood at the entrance being strongly contrasted with the continuous sand-hills stretching towards it from Sandy point.

Abreast of Rio Payon is the limit of the 3-fathoms navigation in this quarter. The spit of Ortiz bank here leaves the shore in a south-east direction, and forms a *cul de sac*, named Payon bay, where there is a rather exposed anchorage for vessels in 3½ fathoms, mud. There is, however, an inshore channel, between the great mass of the Ortiz bank and the land, for coasters, gunboats, and all vessels

that do not draw more that 12 feet water, to Colonia, a distance of 37 miles. At the river Cufre, 6 miles beyond the Pereyra, the sand-hills become more elevated, rising to 150 feet; and the coast changes from a north-west to a west direction, and so continues to Colonia.

From the river Cufre westward, there are three points. The first, Rosario point, formed by the embouchure of the river of the same name, is low, and not easily distinguished. Sauce point is easily made out, as it is the most wooded on this part of the coast, and has sand-hills 105 feet high, 1½ miles to the north. Rocks, partly uncovered, lie south-east of the point, about half a mile distant. A small artificial port has been formed at Sauce point: at the end of the pier there are 12 feet water, and less further in. A cluster of rocks, showing at low water, lie 3$\frac{3}{10}$ cables from the pier, and is marked by a perch. Coasters may anchor under the lee of this point, sheltered in winds from S.E. to North. Artilleria point, at 5 miles west of Sauce point, forms with it a bay of the same name, into the head of which Sauce rivulet empties itself. The sand-hills here rise to 150 feet above the sea. Artilleria point is bordered by rocks, which extend 4 cables to the southward.*

About 9 miles westward of Artilleria point is the outlet of the Rio Chuelo, and 2 miles beyond are the Lagunas des Patos, off which the water deepens to 4 fathoms, deepening to 6 fathoms towards Colonia.

LIGHT.—A *fixed* white light is exhibited on a hillock half a mile north of Sauce point, visible in clear weather from a distance of 4 miles. Not to be depended on.

PIPAS ROCKS, 6½ miles W. by S. ½ S. of Artilleria point, and 2 feet high, lie 1¾ miles off shore, the surrounding reef extending 1½ miles in an east and west direction, with a depth of 2½ fathoms all round. At 1½ miles N.E. of the Pipas, and at one mile from the shore, is a reef, which dries; and 1½ miles S.W. ¾ W. of the Pipas lies a rock, with 7 feet water over it.

COLONIA† is built on the slightly elevated point of a peninsula; the town is dilapidated in appearance, but has a considerable trade in hides and wool. The town is in telegraphic communication with Monte Video and Buenos Aires by means of a submarine cable; also communication by a small steamer, weekly. Meat and game are cheap and plentiful; vegetables and fruit are scarce.

* *See* Admiralty chart:—North shore of Rio de la Plata, Sauce point to Martin Garcia island, No. 1,751, scale, $m = 0{\cdot}9$ of an inch.

† *See* Admiralty chart:—Colonia roads, No. 2,004, scale, $m = 4{\cdot}0$ inches.

Islets.—Reefs.—San Gabriel island situated $1\frac{1}{2}$ miles west of Colonia, is low, covered with brushwood, half a mile long and a quarter of a mile broad. A reef extends 2 cables from the south-west point of San Gabriel island, and patches of 18 feet lie between 3 and 5 cables southward of that point; the outer patch of 18 feet, rock, has depths of 29 to 33 feet within a short distance, and lies with Farallon lighthouse bearing W. $\frac{3}{8}$ S., distant $1\frac{1}{16}$ miles. These patches lie in the fairway to Colonia road. A shoal on which H.M.S. *Ruby* grounded, of small extent, with a depth of 11 feet, mean low river, and 17 feet close around, lies with Farallon lighthouse bearing S. 67° W., and the East point of San Gabriel island N. 20° W. distant $2\frac{1}{4}$ cables. At a quarter of a mile eastward of San Gabriel is the Laja, a rocky bank, half a mile in extent, on which the sea breaks in a strong breeze.

A red conical buoy is moored at the north-east extreme of Laja bank, with the windmill bearing N. 78° E., $9\frac{1}{3}$ cables, and a black conical buoy at the south-east extreme, with the windmill N. 70° E., $9\frac{1}{3}$ cables. A cluster of rocks upon which there are 9 feet at low water lie $2\frac{6}{16}$ cables N. 63° W. from Colonia lighthouse.

Farallon is a rocky island 12 feet above the sea, covered with trees; a lighthouse stands near its centre. It lies S.W. by W. $1\frac{1}{3}$ miles from San Gabriel, and is surrounded by a reef; isolated patches extend 7 cables to the northward and north-eastward, with 6 to 16 feet water on them; from the south-east side the reef extends nearly 4 cables, with a depth of 17 feet at one mile distant. The west end of Lopez west islet shut in with the west end of San Gabriel island, leads eastward of the reef.

A rock, having a depth of 15 feet, marked by a black buoy, lies $1\frac{1}{2}$ miles W. by S. $\frac{1}{4}$ S. from Farallon island; and another of 17 feet at one mile in the same direction.

Lopez islets lie east and west about 2 miles north-west of Colonia; they are bare rocks, 8 and 10 feet high, each in the midst of a long sandy flat, which extends to the north-west beyond Hornos islands. There is a channel between the two islets and flats, about 2 cables wide, with about 16 feet of water. Northward of Lopez East islet a deep bight runs eastward into the sandy flat, having a depth of 20 to 24 feet, which is named Lopez road. At $1\frac{1}{2}$ cables north of the islet, H.M.S. *Comus*, in 1847, was hove down to repair damages, this being the most sheltered spot on this part of the coast.

Beaumanoir reef, with a least depth of 12 feet, lies S.W. by W. ½ W. from West Lopez islet, and N.N.W. distant 1½ miles from Farallon lighthouse; it was so named from a French brig that touched upon the rock in working up to Hornos anchorage. From the rock, an isolated tree on the coast is in line with the west point of the Middle Hornos islet, bearing N. ½ E.

Fishers (Pescadores) Bank, the north-west spit of Ortiz bank, forms the shelter to Colonia road on the south. It has patches of 10 to 12 feet towards its north-west extremity, which must be guarded against in passing. This bank is reported to be extending to the westward.

LIGHTS.—From a white lighthouse at Colonia, near the south-west angle of the plaza, is exhibited at an elevation of 110 feet above the sea, a white *revolving* light, which attains its greatest brilliancy *every three minutes;* the light is visible, in clear weather, at a distance of 10 miles. The period of revolution is said to be irregular.

Also, from a lighthouse on Farallon island, there is exhibited at an elevation of 83 feet above the sea, a *fixed* white light, visible in clear weather from a distance of 13 miles.

The Roadstead is well protected by islets and reefs to the westward, except from winds between S.W. and S.E. It is in some respects a more convenient place for vessels of war than Monte Video. With a southerly gale, which is the only one to fear, the tide invariably runs to the southward, sometimes at the rate of 3 or 4 miles an hour, and thus eases the vessel's cables. The reefs which shelter the road make the entrance difficult, and render it necessary to take a local pilot.

The bar, at the entrance to the road, is composed of hard sand and rock, with a least depth of 18 feet; the bottom on either side is of soft mud. H.M.S. *Amethyst*, 1883, had as much as 24 feet on the bar, with high river.

Anchorages.—The best anchorage in Colonia roads, is with Farallon island in line with the south edge of San Gabriel island, in 4 fathoms, stiff mud, and on the leading mark; if necessary, moor with open hawse to the S.S.W. Vessels of 18 feet draught, may anchor in 3½ fathoms, at half a mile off shore.

There is good anchorage on the north-east side of Gabriel island, but vessels should moor. Coasting vessels in this vicinity when overtaken by bad weather seek shelter here.

Pilots.—A pilot boat is stationed about 6 miles S.S.W. of Farallon lighthouse; her distinguishing marks are a small blue flag with a white square in it, during the day; and a *red* light at night. This position is not to be depended on, as she has been found as much as 6 miles further to the south-eastward.

DIRECTIONS.*—In steering for Colonia from the south-west, from the main channel of the La Plata, the first object observed will be Farallon lighthouse, then the low flat island of San Gabriel, which is covered with stunted brushwood. Farallon lighthouse, in vessels of 18 feet draught, should not be brought to the westward of North, until within 2 miles of it, when course should be altered to the north-eastward to just shut in West Lopez islet with the west end of San Gabriel island; this mark leads eastward of Farallon reef. When past the reef, or with Farallon lighthouse bearing W. by N., the whole of West Lopez islet should be opened west of San Gabriel, to clear the patches southward of the latter island; and when Colonia windmill is seen over the south window of the Italian Consul's house (painted yellow with four trees in front), it may be steered for, passing about 2 cables south of Gabriel island, and crossing the bar with a least depth of 18 feet at low river. When the whole of Lopez West islet is open east of San Gabriel island, steer East, until the windmill comes in line with the lighthouse at Colonia; keep this mark on until the east extreme of Middle Hornos island is in line with the west extreme of Lopez East islet, which leads into the best berth in the roads.

In approaching the anchorage, the shoal off the north-west point of Colonia, should be given a wide berth, particularly on the ebb tide, which is stated to set towards it, at the rate of one to 2½ miles an hour.

Hornos Islands lie 2 miles N.W. by N. of Lopez islets; they consist of three small low islets lying in an east and west direction, with a channel named the Bergantines, with 15 to 19 feet between the two eastern. The central and western islets are situated on a bank, which further extends in a W. by S. direction, 6 cables from the islets; the depths on it are from 10 to 16 feet, rock and hard mud. Near the Western extremity of the bank is a rock, having a depth of 12 feet. Colonia church open south of West Lopez island leads westward of the rock.

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* *See* directions, for entering the Rio de la Plata, at page 268; and approaching Colonia and Buenos Aires, at pages 270–273.

The Hornos islands afford excellent shelter from south-west winds round by south to E.S.E. The strongest winds are from the westward, but then there is less sea and they are not felt so much as those from S.E. to E.S.E.

The best anchorage is 3 cables N.N.W. of the western islet, in 18 feet mud; vessels of war on this station frequently resort to this station to exercise their guns at a target.

On 1st October, 1888, the British steam-vessel *Bellaura* struck and passed over a sunken rock or wreck lying about 2 miles westward of Hornos islands. The vessel at the time of striking was drawing 17 feet. Depths of 22 and 23 feet were obtained by the lead just before striking.

The rock or wreck is stated to lie with Hornos island bearing E. by N. ½ N., and Farallon lighthouse S.E. ½ S.

The coast on the south side of the Rio de la Plata will now be described.

CHAPTER VII.

RIO DE LA PLATA; SOUTH COAST.—URUGUAY AND PARANA RIVERS.

Variation in 1893.

English bank - - 7° 30′ E. | Buenos Aires - - 8° 10′ E.
Cape S. Antonio - - - 7° 50′ E.

THE south bank of the Rio de la Plata is low, uniform, and uncultivated; the only objects visible from the offing are groups of trees which are scattered along the coast, rendering the navigation near it difficult. This coast is the termination of the pampas of Buenos Ayres, immense monotonous plains, resembling the deserts of Africa, which extend to the chain of the Cordilleras, 420 miles to the westward. The only vegetation is an occasional ombu tree, the only large tree which grows in the pampas; it attains a height of 40 to 50 feet. There is no water but that from the marshes, and the only occasional inhabitants are a miserable tribe of Indians, who sometimes visit the coast for pillage. The great quantity of salt which is everywhere found on the soil, renders this country uninhabitable.

CAPE SAN ANTONIO.*—Rasa point, the northern extremity of the ill-defined cape of San Antonio, is a low sandy spit; breakers extend nearly 1½ miles northward of it, towards Cabo bank. Near the point, is a chain of sandy downs trending to the southward, increasing in height to Medano point, where they are from 65 to 80 feet above the sea. The coast is of light colour, with occasional tufts of stunted brushwood, and in clear weather this part of it may be seen from a distance of 8 or 10 miles.

Vessels of moderate draught may approach the cape to a distance of 3 or 4 miles.

LIGHT.†—On Rasa point stands a tripod shaped lighthouse 197 feet high, and painted lead colour, from which at an elevation of 190 feet above the sea, is exhibited a *flashing* white light *every thirty seconds*,

* *See* Admiralty chart:—Rio de la Plata, No. 2,544, scale, $m = 0{\cdot}2$ of an inch.

† The position of the lighthouse is stated to be—Lat., 36° 18′ 22″·4 S.; long. 56° 44′ 30″·5 W.

visible *twelve seconds* and eclipsed *eighteen seconds*, and should be seen in clear weather from a distance of 20 miles.

Tuyu bank, within a depth of 3 fathoms, extends nearly 10 miles from the shore north-westward of cape S. Antonio, and the sea breaks on it at one mile from the shore, when the wind is from seaward. The bottom on the bank is extremely soft, the depth decreases gradually, and with the lead going there is no danger.

Cabo bank is the shoal portion of Tuyu bank and is 5 miles long in an east and west direction; its shoalest part, of about one fathom, generally breaks. It lies N.N.W. ½ W. about 5 miles from Rasa point.

Tides.—It is high water, full and change, off San Antonio cape at about 10h.; and the spring rise is 5½ feet. In fine weather the tides are regular, but with strong winds from the south-east quarter, the water rises about 3 feet above the ordinary springs, and it falls with the winds from the north-west quarter.

SAN BORONBON BAY, formed between cape San Antonio, and Piedras point 54 miles to the north-north-westward, is about 20 miles deep. From the cape, the low flat shore nearly level with the sea, turns to the westward, and north-westward to Juncal island. The coast between is rendered visible at a short distance by the stunted and scattered brushwood growing on the sand. Close to the westward of the cape is the little river Tuyu, communicating with several lakes: coasters of very light draught can enter the river.

The first remarkable group of trees, on Juncal island, is about two-thirds of a mile from the shore, and 32 miles north-westward of cape San Antonio; about 7 miles to the northward is the Rodeo group. In this neighbourhood the sand-hills begin to rise, though they do not exceed a height of 20 feet. Coasters of light draught will find convenient anchorage off Rodeo, at 2 miles from the shore, in 10 feet, soft mud.

Mount Rosas, a sandy down a little higher than the surrounding land, covered with trees, about 12 miles northward of Juncal island, is about 30 feet above the sea. The village of Pampas formerly stood on its summit, the ruins of which still remain.

Salado river.—The Salado is a shallow bar river, unfit for any but small craft. At times, when the La Plata is high, there is from 6 to 10 feet water on the bar, but at other times it dries, and the mud is so soft that one cannot walk from the boat, aground, to the firm land. The entrance will be known by the red brick-kiln and mount

Rosas, southward of it. There are a few houses near the Salado. At one mile off its mouth, coasters will find anchorage similar to that off Rodeo.

At 5 miles northward of the mouth of the Salado, is the San Boronbon, a small stream often dry. The coast between is from 14 to 20 feet high.

Tides.—It is high water, full and change, at the Salado river at 10h. 45m.; and the rise is about 6 feet.

Mount Juan Geronimo.—Between the San Boronbon and Piedras point north of it, is a chain of small sandy downs, on which some trees are seen. The most remarkable is 6½ miles southward of the point, and named mount Juan Geronimo.

PIEDRAS POINT, in lat. 35° 27′ S., long. 57° 7′ W., is low, and projects very little; it is composed of *tufa*, a species of friable compact sandstone, and appearing to be of hardened mud. This stone, known in the country by the name of *tosca*, is formed in various places on the coast as far as Buenos Aires, and forms a girdle of dangerous banks of 5 to 6 miles mean breadth.

On Piedras point there is a group of trees known as Tala clump.

Salvador Grande point lies N.W. by N. 5 miles from Piedras point, and at about 7 miles farther on in the same direction is Indio point.

Piedras bank.—Piedras point, and that of Indio about 12 miles to the north-west of it, is bordered by a bank of tufa and coarse gravel, and within a depth of 3 fathoms, is from 6 to 8 miles in breadth; thence the bank continues along the coast to the north-west at the distance of 7 or 8 miles, gradually narrowing towards Enseneda de Barragan, where it terminates.

North-eastward of Piedras point, the bank extends for a distance of 20 miles, with a depth at low water of about 3 fathoms, and forming a bar to the river. There is a depth only of 16 feet at low river, 11 miles from the point. From the nature of the coast, great caution must be used in approaching it.

As the bank is approached, the Cerro de Salvador Grande, on which are some trees, and Tala clump or Piedras point, can be seen.

In estimating with the eye the distance from the coast, great errors are likely to be made; more so when in the La Plata, from the frequent effects of the mirage and extraordinary refraction, which lower and raise considerably the objects in view near the horizon.

INDIO POINT is low and projects but slightly ; it may be recognised by a long grove of trees planted in the vicinity of Tufted hill, and now overtops it. The trees are visible from a vessel's deck about 13 miles distant, and make as an island, being seen some time before any other object on the point. In the immediate vicinity of the point the country is a flat grass plain ; a small stream, here, may be ascended by boats at half-tide unless the water in the river be very low. The crew of the light vessel frequently land here for supplies, which are procured from the neighbouring farm.

Having passed the point, a continuous line of brushwood of uniform height will be observed for a distance of 18 miles, until Magdalena village is approached, when the scattered ombu trees and slightly rising ground near it are more easily distinguished. It is difficult to make out the different points, as they only slightly project, and the coast cannot be approached on account of the banks which border it. By night, it is necessary to navigate with the greatest care when near Indio point, as the currents are strong and the ebb tide sets on to the coast bank.

Tides.—It is high water, full and change, at Indio point at 11h. 45m. ; rise about 4 feet.

LIGHT VESSEL.—For description of light vessel off Indio point, *see* page 266.

Magdalena.—When to the north-west of Indio point, the most prominent ombu trees seen are in the precincts of Magdalena, and farther on is the little village and church of that name, but it is obscured on many bearings, by the trees, and is at all times difficult to make out.

Embudo and **Atalaya points.**—In front of Magdalena is a slightly projecting point with trees on it, named Embudo. A red brick saledero, or slaughter-house, having a look-out place on it, is situated near the point, and a small creek connecting with the river at half-tide passes close to the house. Coasters of 4 or 5 feet draught load here with tallow and hides. Atalaya point, at 11 miles to the north-west of Embudo, is low and sandy, and difficult to recognise ; the clumps of trees, and clusters of underwood, with which the coast is dotted being similar in aspect. The coast bank extends nearly 4 miles off this point.

Santiago point.—At about 10 miles farther to the north-west is

Santiago point, at the entrance to Barragan bay. The point is low and covered with bushes.

ENSENADA DE BARRAGAN,* situated about 10 miles west of Atalaya point is open to the W.N.W., and is only available for small craft, with local knowledge. A spit dries off Santiago point, the eastern extreme of Santiago island, in a W.N.W. direction for the distance of half a mile. The channel south of the spit is about half a cable wide, and the depth on the bar at low water is from 3 to 8 feet. The channel is marked by three buoys, which should be left on the starboard hand. The inlet was formerly deeper and more frequented, but from the accumulation of mud the water is shoaling daily; its shores on either side are swampy, thickly wooded, and intersected by numerous creeks. In the middle of last century large vessels unable to go Buenos Aires entered this inlet. At that time there was a depth of about 16 feet on the bar at low water, and 6 to 10 feet where the ground is now dry.

Ensenada is connected by railway with La Plata, Punta Lara pier, and Buenos Ayres.

From Santiago village, situated at about 1¾ miles eastward of Santiago point, there are two piers 330 yards apart, and 2⅓ miles in length in a N. 25° E. (true) direction. Their extremities curve towards each other, leaving an entrance about 220 yards in width. A channel dredged to a depth of 23 feet (in 1890 the depth was 21 feet), will be continued up the canal as far as the docks.† These docks are distant 4¾ miles from the pier heads, and the city of La Plata lies about 3 miles above the docks.

The services of a pilot are necessary for entering the port, no vessel of any size being permitted to enter without one. The two piers, extending out into the roads, form the entrance channel to the docks. From the outer entrance of the channel to the head of the Dique de Maniobras (at south end of the Grand dock) there is a depth of not less than 21 feet.

H.M.S. *Cleopatra*, drawing 21 feet, went into the Grand basin in May, 1890.

In the Puerto Rio Santiago there is a depth of 21 feet from east side of the entrance channel to the Puerto Occidental.

The south half of the Puerto Intermedio has a depth of 21 feet; the remainder is not yet constructed.

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* *See* Admiralty plan:—Ensenada de Barragan, on chart, No. 2,544, scale, $m = 2$ inches.

† There is seldom less than 28 feet, water, outside the port works.

In the Puerto Occidental there is a depth of about 18 feet, and throughout the length of the Canal Lateral Oeste, to and including Dique No. I., from 6 to 7 feet.

The Canal Reunion Oeste is nearly completed, and small boats pass through it. The Canal Lateral Oeste, Puerto Oriental, Canal de Conclusion, Dique No. 1., and Canal Reunion Este are under construction.

It is proposed to increase the depth of the Canal Este to 16 feet, and the width to 22 yards.

Eight large warehouses are completed, and are in use in Puerto Rio Santiago, between the Canal de Entrada and Puerto Occidental. The railway runs on both sides of the dock, and thence to La Plata. At the berths where large vessels are moored in Grand basin the depth is 25½ feet.

During a heavy gale on 2nd May, 1890, the water was blown out of the river, producing the lowest water known for 70 years. At its lowest there was a depth of 21¼ feet in the deepest part of the dock, where vessels are moored, and about 17½ feet in the rest of the dock and in the channel. With no abnormally high tides the deepest water noted in the Grand dock was 31 feet.

Coal.—Vessels can coal with facility on both sides of the dock by movable steam cranes, and from lighters on the off side.

Santiago.—Santiago village, is built of wood, and inhabited chiefly by the workmen employed on the piers and canal.

LIGHTS.—A fixed *red* light is shown from the extremity of the eastern pier, and a fixed *white* light from the extremity of the western pier.

La Plata, the new fortified capital of the province of Buenos Aires, created by law, and the foundation stone laid in 1882, was inaugurated in April, 1884, the public departments being removed thither from Buenos Aires. The city (1892) contains 65,000 inhabitants, and is lighted by electricity. Two of these lights are at a considerable elevation, and may be seen from a distance of 22 miles, and the glare of them for some distance further. The column of the higher one stands near the centre of the city, and is a conspicuous object by day, in clear weather, appearing from a distance of 10 miles like a tall chimney standing upon an even-topped range of hills, but which, in reality, is a plantation of eucalyptus trees.

Santiago bank, with a least depth of 7 feet, lies westward of the approach to Ensenada; its outer edge is 3½ miles north-eastward of Punta Lara pier.

Directions.—When approaching from the eastward, having cleared Chico bank, steer (allowing for current) to sight Sántiago piers a little on the port bow. There is anchorage about 2 cables off the extremes of the piers in 20 to 28 feet, depending on the height of the river, in muddy bottom. When approaching from the north-westward, give Santiago bank a good berth. Small craft entering the bay from the eastward, may pass round Santiago point at the distance of three-quarters of a mile, and when a solitary hut a quarter of a mile westward of a remarkable clump of trees bears about South, distant three-quarters of a mile, or with the entrance fully open, steer E.S.E., making allowance for the current which sets 2½ miles an hour with the ebb; this will lead into the inner anchorage, where vessels may lie in 2 fathoms, mud, and smooth water in all weather. Coming from the westward, pass Lara point at the distance of half a mile; then steer S.E. by E. along the shore at the same distance until the hut bears South three-quarters of a mile, and proceed as before.

PUNTA LARA.—A railway pier 2,845 feet in length, with machinery for loading and discharging cargoes, has been constructed 3 miles to the westward of Ensenada harbour, or about midway between that place and Punta Lara; at the outer end of the pier there is a depth of 16 feet at low water, soft muddy bottom, but strong south-westerly winds decrease the depth to 14 feet. Vessels drawing 16 feet water can unload alongside the pier, as there is a depth of 5 feet of soft mud, but it is advisable to haul off with northerly winds, as vessels have sustained damage.

It was proposed to construct a breakwater for the protection of Punta Lara pier head.

This place, included in the port of Ensenada, was opened as a port of entry in 1874.

Anchorage.—Punta Lara road, situated between Punta Lara and Punta Lara pier, with depths from 16 to 18 feet, is recommended as a good winter anchorage for vessels of moderate draught, being protected from winds to the southward of East and West, which are the most dangerous on this coast; northerly winds appear to have little or no effect on the anchorage, as the sea is broken by the outlying

banks. A good position is with Santiago poplars bearing S.E. by E., and the red house at Punta Lara S. by E. ½ E.

Vessels drawing 13 feet can enter Punta Lara road at low water. The channel is buoyed by the railway company, who have also laid down several screw moorings off the pier.

Directions.—Vessels intending to go alongside the pier should, on arriving at the old anchorage off Punta Lara, apply to the authorities for a pilot. No charges will be made except for the transport of merchandise by rail. The services of a steam tug are available.*

Communication can be had by railway twice a day, between Ensenada harbour, Punta Lara pier, and Buenos Aires.

Tides.—It is high water, full and change, at Ensenada de Barragan at about 7h. ; and the rise is stated to be from 5 to 9 feet.

Quilmes point.—Lara bank.—At 9 miles to the westward of Punta Lara, is Quilmes point, in approaching which the rising edifices of Buenos Aires and the vessels at anchor in the outer road will be seen. Between Ensenada de Barragan and Buenos Aires the low grassy shore is partly inundated with a very high river.

Lara bank, of 2 fathoms, lies 4 miles off shore, and the same distance N.N.W. ½ W. of Punta Lara ; it must be guarded against in approaching Buenos Aires.

PALMAS FLATS is a great bank formed of the sand brought down by the Uruguay and the Parana, and deposited over the whole of the upper part of La Plata. The depths over its outer part are from 2¼ to 2¾ fathoms, over its inner part from 1¼ to 1¾ fathoms, and shoaling still more near the mouths of the great rivers.

Vessels leaving the outer road of Buenos Aires for Colonia, or Martin Garcia channel, should take into consideration the vessel's draught and state of the river, and steer to the eastward, if necessary, to round the flats in the deeper water. Farallon light, N.E. or northward of that bearing, leads clear, in about 3 fathoms of water.

BUENOS AIRES,† formerly the capital of the province of the same name, was founded in 1535, and stands on the right bank at the head of the estuary of the Rio de la Plata, on a vast plain, which is here about 35 or 40 feet above the sea, and which extends

* H.M.S. *Cracker* remained three weeks at single anchor, off the pier, and Commander Buckle considers it the best winter anchorage for H.M. ships in the Rio de la Plata.

† *See* Admiralty plan :—Buenos Aires roads, No. 2,526, scale, *m* = 2·0 inches.

westward to the Andes. The level uniformity of its outline is only broken by the spires of various churches. The streets are regular and straight, intersecting each other at distances of about 150 yards, and forming squares. The houses have never more than two storeys, and commonly only one. In 1892 the population of Buenos Aires was estimated at about 500,000.

The city is the seat of government, of an archbishopric, and of all the diplomatic representation accredited to the Republic. The cathedral has a handsome dome and a portico with twelve corinthian pillars. There are several churches, including two English, and a Presbyterian chapel.

Buenos Aires is connected by railway and telegraph with all the principal towns, and by submarine cable with Europe. International communication is kept up by the employment of nearly 1,000 steamers. The imports are manufactured goods, cottons, earthenware, gunpowder, hardwares and cutlery, iron, leather, linens, oil, linseed, woollens, &c.; and the exports are bones, copper unwrought, grease, horsehair, hides, horns, skins of various kinds, tallow, tobacco, wood, &c. The value of the imports to the Argentine Republic in the year 1882 was 11,854,073*l.*, and that of the exports 11,688,181*l.*, 80 per cent. of which passed through Buenos Aires. All kinds of supplies may be procured.

Coal.—From 4,000 to 5,000 tons of coals are annually kept in stock, and coal can be put alongside in lighters at the rate of about 100 tons per day. Coaling is more expensive and much slower here than at Monte Video, and as the draught of water of vessels, which must of necessity cross the bar of the river near Indio point light-vessel, must be considered, they usually coal at the latter place. During summer, when strong south-east winds prevail during the day, communication with the shore is impeded; at all times of the year coaling is liable to interruption.

True bearing.—From San Miguel Tower, 68 feet high, a little westward of the cathedral, the true bearing of the north Cerro de San Juan on the Banda Oriental coast is N. 39° 41′ 34″ E.

Boca del Riachuelo.—At 1½ miles southward of the city, is the river Riachuelo, the commercial port of Buenos Aires. Two piers, each about 450 yards in length, project in a N.E. by E. ½ E. direction, and form the entrance to the "Boca," as the dredged out portion of the Riachuelo is locally termed.

The canal dredged to the docks is 7½ miles long, from No. 14 buoy to the entrance piers, with a least depth of 16 feet at low water, and lies in a S. 61° W. direction. This channel is marked by pile beacons and buoys, red on the starboard hand, and black on the port hand, when entering. A fixed light is exhibited on the outer beacon (on starboard hand) entering.

From the inner end of these piers, the bed of the Riachuelo has been deepened for nearly 2 miles, the north bank lined with wooden wharves, and the width of the stream increased. The upper part in the vicinity of the railway and tramway bridges, is named Barraccas.

A vessel of the Netherlands—American Steam Navigation Company (1890) was taken into the Boca drawing 21 feet 8 inches, but was obliged to be lightened to 17 feet 9 inches, and to wait 8 days for rising water to come out.

Docks.—South Basin—length about 3,600 feet, width 385 feet, width of entrance 225 feet, depth on sill 21½ feet. This basin opened 28th January 1889, is entered from Riachuelo channel. No. 1 wet dock, opened for traffic in January 1890—length 1,870 feet, width 525 feet, width of entrance 66, depth on sill 21⅔ feet. No. 2 wet dock, length 1,870 feet, width 525 feet, width of entrance 23¾ feet. No. 3 wet dock, length 2,265 feet, width 525 feet, width of entrance 66 feet. No. 4 wet dock, length 2,065 feet, width 525 feet, width at entrance 66 feet. North Basin, length 1,465 feet, width 1,130 feet, width at entrance 260, depth on sill 21 feet. All the docks and basins are connected by railway.

A dock 300 feet long, 51 feet wide, and 11 feet deep over sill at high water ordinary springs, and which has taken a vessel drawing 14 feet, is situated at San Fernando, about 15 miles above Buenos Aires, eastward of the mouth of the Tigre river. The channel to this private dock, has about 13 feet at high water.

LIGHTS.—A fixed white light is shown from the tower of the custom-house at Buenos Aires.

From the outer extremity of each of the two stone piers at Riachuelo, there is exhibited at an elevation of 42 feet a fixed *red and white* light.

When a vessel is on the line of the dredged channel, both lights will appear white, but when out of the line of the channel the nearer light will appear *red* and the farther light *white*.

LIGHT VESSEL.—At $8\frac{1}{10}$ miles N. 85° E. from Merced church at Buenos Aires, a hulk or staticnary guard ship is moored in 16 feet water, the vessel is painted black, has three masts, and shows a *fixed* white light about 20 feet high, visible 7 miles.

ANCHORAGES.—Outer road.—Bar anchorage.—The outer road of Buenos Aires is a remarkable depression of the bed of the river eastward of the City bank; the northern portion is between that bank and the Camaron, a tongue of the great Palmas flat. It is about $3\frac{1}{2}$ miles from the shore, 3 to 4 miles in length in a north-west and south-east direction, and from a half to three-quarters of a mile in breadth, with depths of 18 to 22 feet over soft mud; the shoal water being towards the east and west extremes. The approach to this anchorage is over a bar or flat with only 15 feet water on it at the mean level of the river, and at times not more than 12 feet, which obliges vessels of moderate draught to anchor at about 8 miles from the town in about 21 feet water, with the guard light vessel about West, distant 3 miles. This latter position is known as the Bar anchorage. The Royal Mail and other large steam vessels use this anchorage.*

From the bar anchorage, the soundings gradually decrease to the bar; having passed the light vessel, a W.N.W. course for 2 miles will lead to the southern part of the outer road, the surroundings gradually increasing, and the bottom becomes softer.

From the middle of this road, Riachuelo pier lights bear about S. $\frac{1}{2}$ W.; and Recoleta church S.W. $\frac{3}{4}$ W., with a depth of about 21 feet. It is not usual to moor in the outer roads, but to veer a long scope of cable, and be ready to drop a second anchor with south-easterly winds.

These roads are exposed to winds from S.E. to E.N.E., which often bring in a heavy ground swell; vessels frequently drag, foul each other, and sometimes go on shore. It is necessary to have good ground tackle; also to avoid grounding on their anchors, or on those of vessels in the road. The bottom is a fine dark sand; within the 12-feet line of soundings it is generally hard, and from 12 to 15 feet, hard and soft; beyond 15 feet it is mostly soft muddy sand.

Vessels are liable to ground in low river, but as the bottom is soft, it is seldom the cause of damage.

Loading or discharging cargo is prohibited in the outer road;

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* *See* directions for approaching Buenos Aires at pages 270—273.

should, however, there not be sufficient water for vessels fully laden to proceed out of the docks, the loading may be completed in the outer road.

Vessels of heavy draft that cannot enter the docks, must proceed to the port of La Plata.

Caution.—The greatest caution must be exercised in taking up a berth in either road, on account of wrecks, which sometimes are numerous. There are always a large number of vessels lying here.

Wrecks.—The following list of wrecks obstructing Buenos Aires roads is from a report by the Senior Naval Officer, on the South-east America Station, 1890. It is possible that others exist.

No. 1	lies with the light on the South Custom House, Buenos Aires,			bearing S. 23° 45′ E.,	distant	$1\frac{19}{20}$	miles.
„ 2	„	„	„	S. 16° 30′ E.	„	$1\frac{9}{10}$	„
„ 3	„	„	„	S. 12° 20′ E.	„	2	„
„ 4	„	„	„	S. 6° 20′ E.	„	$1\frac{8}{10}$	„
„ 5	„	„	„	S. 9° 0′ W.	„	$1\frac{8}{10}$	„
„ 6	„	„	„	S. 10° 0′ W.	„	$1\frac{11}{20}$	„
„ 7	„	„	„	S. 14° 15′ W.	„	$2\frac{9}{20}$	„
„ 8	„	„	„	S. 25° 15′ W.	„	$2\frac{8}{10}$	„
„ 9	„	„	„	S. 32° 0′ W.	„	$\frac{8}{10}$	„
„ 10	„	„	„	S. 35° 20′ W.	„	$1\frac{1}{10}$	„
„ 11	„	„	„	S. 37° 0′ W.	„	$\frac{19}{20}$	„
„ 12	„	„	„	S. 55° 40′ W.	„	$3\frac{9}{20}$	„
„ 13	„	„	„	S. 57° 15′ W.	„	$4\frac{2}{10}$	„
„ 14	„	„	„	S. 68° 10′ W.	„	$4\frac{13}{20}$	„
„ 15	„	„	„	S. 87° 15′ W.	„	$3\frac{3}{10}$	„
„ 16	„	„	„	S. 88° 30′ W.	„	$3\frac{8}{10}$	„
„ 17	„	in lat. 34° 35′ 15″ S.,		long. 58° 13′ 15″ W.			
„ 18	„	„ 34° 37′ 0″	„	58° 12′ 0″			
„ 19	„	„ 34° 35′ 45″	„	58° 4′ 0″			
„ 20	„	„ 34° 37′ 30″	„	58° 10′ 0″			

Inner road.—The inner or little road, off the north-east angle of the city, is a space of about $1\frac{1}{2}$ miles in length, in a north-north-west direction, and about 3 cables in breadth, having 12 and 13 feet water. It is formed between the City bank and the coast; the latter is bordered with a bank of rotten stone. Northward of the inner road is the anchorage El Pozo, having about a foot more water. Vessels in the Pozo and inner road always moor north-east and south-west,

and great attention should be given to prevent grounding on the anchors, for frequently there are only depths of 8 or 10 feet, and vessels are often aground and unable to go to sea for 15 or 20 days. As the fall of the river depends mostly upon westerly winds, vessels should have a good scope of cable on the east anchor. A large number of vessels are always here.

In proceeding from the outer to the inner road, steer N.W. by W. until the church of Recoleta bears S. by W. ½ W., then steer on this line across the west part of the City bank over soft bottom, in from 10 to 13 feet water, at the mean level of the river, until 1½ miles from the shore; when about a S.S.E. ½ E. course will lead to the anchorage. The depths of water over this part of the bank are about the same as elsewhere, but this track is chosen by the heavier vessels on account of the soft nature of the bottom; it is 4 miles longer than the Catalina.

The Catalina channel, south-eastward of the above, is a slight depression in the City bank, but the bottom is harder; it is much used by vessels under 10 feet draught. A red buoy, with a black band, is placed at the outer extremity of the channel, and on the south side of it, in 10 feet water; with the custom-house bearing S.S.W., and Recoleta church S.W. ¼ W.

It is advisable when going to the inner road to employ a pilot, particularly for the purpose of choosing a clear berth, and avoiding the many lost anchors in the roads.

Quarantine regulations.—Vessels of less than 19 feet draught will not be considered as having entered the port, nor be visited by the health officer unless westward of the line of Quilmes church bearing S.W. by S. If of greater draught, hoist a flag at the yardarm, when the health officer will come off.

A red buoy is moored eastward of Bar anchorage in lat. 34° 37′ S. long. 58° 5′ W., to mark the quarantine ground, beyond which a vessel may not approach, if there be any doubt about the sanitary condition of ship or crew.

Landing.—In the roads of Buenos Aires, during summer, when strong south-east winds prevail during the greater part of the day, the sea is so rough that communication with the shore is impeded; but during the winter, when the winds are generally from the south-west or north-west, the sea is smooth, and communication easy.

Tides.—It is high water, full and change, at Buenos Aires at 6h.; springs rise about 4 feet. The time of high water is regular, but the height is affected by the winds. The flood runs 5h., and the ebb 7h., at from one to 2 miles an hour. The winds from the south-east cause the water to rise, and those from the north-west depress it, and in some places cause a difference of 12 feet. A case has occurred when the wind from the north-west has so depressed the water, that a person was able to walk dry to the vessels anchored in the inner road.

Winds and weather.—During summer, between August and March, the winds are from the eastward. About noon, if the barometer be in a mean state, there is generally a calm or little wind which freshens from the south-eastward towards sunset, when it blows fresh, veers to the northward during the night, and becomes calm again about noon. In April, May, June, and July, the weather is variable. The barometer always rises with a south-east wind, which brings clear dry weather; falls for a pampero or south-west wind, but falls lowest with the wind from north to west, which brings cloudy rainy weather. It may be fine weather at sunset, and two hours after blowing a gale, but the barometer is sure to indicate it. For full description of the winds and weather in the Rio de la Plata (*see* pages 276-282.)

The COAST.—From Retiro point, at the north-east angle of Buenos Aires, on which are the gas works, the shore forming Olivos bay, trends north-westward for 9 miles to the point of that name, a bluff 62 feet above the sea. At 2 miles westward of Buenos Aires is Palermo, formerly the palace of Rosas. The village of Belgrano stands on some high level ground 1½ miles inland. Some streams empty themselves into the bay. At 6 miles N.W. by W. from Olivos point, is the mouth of the little river Tigre, where commences the delta of the Parana.

AMARGA POINT.—LIGHT.—A *fixed* white light is exhibited from Amarga (Olivos) point, about 9 miles northward of Buenos Aires, at an elevation of 32 feet above the level of the river, and visible in clear weather from a distance of 5 miles.

Tigre river.—Vessels of less than 8 feet draught can navigate to the Tigre, where there is an excellent port and dock (*see* page 258), and where small craft may beach for repairs. In strong winds from the south-east many small craft leave the roads of Buenos Aires to

seek shelter there, but it is necessary to have a good pilot, as the channel is winding, and subject to frequent change. In some parts there are depths of 13 or 14 feet, but the deepest is off the shore forming Olivos point, where there are depths of 12 to 17 feet.

Above the Tigre the shore trends northward, and completely changes its appearance; it is broken by a great number of small rivers, outlets from the Parana, forming sunken islets covered with wood. Of these outlets there are three more frequented by small craft than the others; the Arroyo del Capitan, the Parana de las Palmas, and the Boca del Mini; but although reputed to be deep, they are generally too narrow and winding to admit of easy navigation.*

APPROACHES TO RIO DE LA PLATA.†

In approaching the Rio de la Plata, discoloured water, caused by the outpour from the river, will be met at a distance of 60 to 75 miles seaward; the bed of the river is formed of layers of soft mud, which is the best guide for a vessel when the land is not seen; the bottom being more or less soft in the channel, and more or less hard on the banks.

Pilots, if required, will be found off cape Castillo. *See* pages 220 and 228.

LA PLATA BANK.—At the entrance to the Rio de la Plata, between the meridians of Maldonado and cape Castillo, is a remarkable bank, with depths of 10 to 20 fathoms, fine sand and broken shells. It extends in a north-east and south-west direction parallel to the coast, at a distance of 40 to 50 miles. At 25 miles eastward of Lobos island it is a part of the bank extending from the shore; thence eastward, it is separated from the shore bank by the mud-well, which off cape St. Maria is 5 miles in breadth, increasing to 20 miles off cape Castillo.

This mud-well has depths of 20 to 40 fathoms.

Soundings of 17 to 19 fathoms are found nearly 50 miles south-east of Punta del Palmer, evidently a continuation of La Plata bank.

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* H.M.S. *Cracker* descended the Parana de la Palmas, and by the Capitan to the La Plata, *see* page 293.

† *See* Admiralty chart:—Sta. Catharina island to Rio de la Plata, No. 2,522, scale, m=0·06 of an inch.

It has long been known that there were detached sand-banks at the entrance to the Rio de la Plata, but the different positions assigned had caused some of them to be considered doubtful. At the present day numerous observations have shown the existence of several shoals, all lying in the same straight line parallel to the coast, and proving to belong to the same bank. The great length and narrow shape of La Plata bank, explain clearly the different positions assigned to these shoals.

From the nature of this work, it can hardly be expected that we should name the various navigators who have from time to time reported the existence of different parts of this bank, now called under the general name of La Plata.

Mud-well.—The mud-well is a very marked depression of the ocean bed between La Plata bank and the coast of Uruguay, the bottom of which (as its name implies) is mud. It is of the consistency of sticky clay, and varying in colour in different parts from that of lead to a bluish black.

This mud channel commences south of Maldonado light, distant about one mile from the coast, and is at this point 11 miles wide. It maintains this width, excepting at one or two points near cape Santa Maria, outward to cape Castillo, where its distance from the coast increases to about 25 miles. Its general direction is about N.E. by E.

English bank, is a dangerous bank of tosca, lying in the entrance to the La Plata. It is 20 miles in length within a depth of 3 fathoms, in a north-east and south-west direction, and 5 miles maximum breadth. Its northern end, 4 miles in extent, north and south, dries in places and the sea continually breaks on it.

From the northern extremity, Flores island lighthouse bears N. by W. distant 11 miles. Masts of wrecks may generally be observed on the bank.

There are depths of 6 and 7 fathoms close to the north end of English bank, and the soundings are found to be regular off the eastern side of it; if common precautions be taken with the lead, the approach towards the bank will be indicated. To the northward of the bank the depth will not be less than 7 fathoms until westward of its meridian. Should a vessel have occasion to anchor near it, the anchor should not remain long in the ground, as from the stiff nature of the bottom there will be great difficulty in lifting it.*

* In December 1864, H.M.S. *Bombay* was destroyed by fire, the remains of the wreck lying nearly due South, 6¼ miles from Flores lighthouse.

The currents in the vicinity of the bank were observed to set in all directions, but generally more towards the east and west than towards the north and south; the greatest rate observed did not exceed 1½ knots an hour.

LIGHT VESSEL.—About one third of a mile off the north end of English bank, in about 7 fathoms of water, is a vessel painted red, having two masts, and which exhibits a *fixed* white light visible from 8 to 12 miles in clear weather.

The light vessel drags from time to time during heavy gales; and it would seem is generally left in the position to which she drifts. No confidence therefore can be placed in her as a guide to clear the bank; and as the jib and spanker are sometimes set to keep the vessel steady, it is then difficult for a stranger to recognise her as a light vessel.*

Archimedes bank, discovered by an English frigate of that name, lies about 6 miles westward of English bank, with depths of 4 to 5 fathoms between. It extends over a space of about 4 miles, with a least depth of 2½ fathoms, sandy bottom; northward and westward of it the bottom is mud, or sand and mud. It should not be approached, unless in a vessel of light draught, nearer than 5 fathoms water. Within 6 miles of the west side of this bank there are depths of 3 and 3½ fathoms.

Rouen bank, was found by the *Ville de Rouen.* From an examination of this bank, made by H.M. surveying vessel *Sylvia* in 1883, it is found to be situated on the meridian of 56° W.. and its northern extremity is about 24 miles southward of the centre of English bank. Within a depth of 5 fathoms, it is 15 miles in length, north and south, by about 4 in breadth. The least water found by the *Sylvia* was 3½ fathoms, black sand, but less water may exist.†

Wreck.—A conical buoy has been placed in 3¼ fathoms, half a cable eastward of the wreck of the *Senegal*, with Cuirassier light vessel bearing West, distant about 16 miles.

A sunken wreck in a position dangerous to shipping, lies with the following approximate bearings:—Flores island lighthouse N. 22° E., about 7½ miles, and Brava point lighthouse N. 54° W.

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* Captain W. J. L. Wharton, H.M.S. *Sylvia*, 1883.

† Astrolabe bank, formerly shown on the charts, eastward of Rouen bank, is by recent examination absorbed by the Rouen bank.

Other wrecks are known to lie respectively N. ¼ W., distant 12 miles, and E. ½ N., distant 22½ miles from Cuirassier light-vessel; also at S.W. ¼ W., distant 2¾ miles from Point del Este lighthouse.

CUIRASSIER BANK is about 3½ miles long in a north-west and south-east direction, about half a mile broad, and has from 17 to 18 feet water on it, the bottom being sand and mud, and in the shoaler places hard sand. Its centre lies N. by E. ¾ E. distant 11¾ miles from the grove of trees on Indio point. There is a channel 3 miles wide on either side of the bank, with depth of from 3½ to 3¾ fathoms, mud. As the Cuirassier bank has as much water on it as the tail of the Ortiz bank, over which vessels ascending or descending the river must pass, it can scarcely be considered a danger.

LIGHT VESSEL.—Between India point and Ortiz bank (about 2 miles southward of Cuirassier bank), a vessel painted black and red horizontally, with the words *Punta Indio* in white letters on her sides, is moored in 3¾ fathoms, with the high grove of trees on Indio point bearing S.W. by S., distant about 10 miles.

This vessel, locally known as Indio point light vessel, has two masts and a turret between, and exhibits at the height of 42 feet above the sea, *an occulting* white light, visible *fifteen seconds* and eclipsed *six seconds*, and in clear weather should be seen from a distance of 12 miles.

A small white light is shown from the taffrail. When pilots are on board a blue flag with white letter P is hoisted.

This light vessel often drifts from her position, and if much displaced, returns to it, mooring on the same bearing of the Grove, but her distance from it may vary considerably, as they have no means but estimation, of ascertaining the distance from shore, nothing but the Grove being seen from the light vessel.

Pilots.—When pilots are on board, a blue flag with a white letter P is hoisted.

These pilots are licensed by the Argentine Government, and merchant vessels are required by the port regulations to employ them, or to pay the pilotage.*

ORTIZ BANK, which is imperfectly known, begins near Colonia; thence it borders the coast to the eastward, as far as the outlet of the rivers Payon and Pereyra, a distance of about 37 miles,

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* *See* foot note, page 270.

and extends in a tongue to the south-eastward across the La Plata, the shoal parts from 9 to 10 feet terminating 15 miles N.E. by N. from Indio point, and about 56 miles from Colonia. This portion, which was examined in 1871, near the shoal water above mentioned, appears to have an average breadth of only 3 miles and to extend parallel to the shore for 20 miles, thence in a south-west direction to Piedras point and joining the shore bank. This portion may be termed the bar of the La Plata, and is about 9 miles across, with a depth of about 18 feet at low river. In the centre of Ortiz bank the depths vary from 9 to 15 feet; and along its north part, at 4 miles from the shore, the bottom is remarkably level, the depths being from 2 to 2½ fathoms.

The bottom is sand, or rocks covered with sand, which the seaman should take into consideration in crossing with a vessel of light draught, as well as the state of the river. The bank may be approached on all sides by the lead, the soundings gradually decrease, and the mud (found in the channel) becomes mixed with sand; the only fear is getting in one of the indentations of the bank more or less deep, and known by pilots under the name of saccos. A vessel should not go nearer than 3 fathoms water.

Ortiz bank forms two channels, one northward of the bank, and close along the north coast, which is practicable for vessels of about 12 feet draught. The other, south-westward of the bank and northward of Chico bank, is more frequented, being the main channel between Monte Video and Buenos Aires.

CHICO BANK lies in the middle of the channel between Ortiz bank and the coast of Buenos Aires, and is a series of small banks of hard sand, about 15 miles long in a north-west and south-east direction, nearly joining the shore bank, the depths upon which vary from one to 3 fathoms with narrow channels of 3 and 3½ fathoms between; these banks are steep to on the north-eastern side. From the 3-fathom northern extremity of Chico bank, Magdalena church bears S. by E. ½ E. 17 miles. A shoal portion of from 7 to 9 feet, lies E.S.E. between 4 and 7 miles from the northern extremity and borders the channel.

The main channel, between Chico and Ortiz banks has from 4 to 6 fathoms water, muddy bottom, which is carried as far as Santiago point; from thence the soundings decrease gradually to about 2½ fathoms at the bar of Buenos Aires.

Southward of Chico bank there is a channel of about 3 miles in

breadth, navigable for vessels under 15 feet draught, but it is not recommended, as the currents run strong, and the soundings in approaching the banks, are not a sufficient guide.

LIGHT VESSEL.—A light-vessel painted red, with three masts, is moored in 4½ fathoms water northward of Chico bank, and 19 miles N. ¼ W. from Magdalena church, and is supposed to be nearly in mid-channel, so that she may be passed on either side; the vessel exhibits a *fixed* white light, visible 10 miles, and under certain conditions of the atmosphere as much as 14 miles. Besides the regular light a small white light is shown at the peak. The vessel is liable to drag, and frequently out of position after gales.

Tides.—In the vicinity of the Cuirassier and Chico light vessels in ordinary weather, the average rise and fall is 4 feet, the ebb setting to the south-east at the rate of from one half to 3 miles an hour, and the flood to the north-west at from one half to 1½ miles an hour.

The coast banks, fronting the south shore of the La Plata, are described in connection with the coast, at pages 249—263.

GENERAL DIRECTIONS.*—Making the land at the entrance of the Rio de la Plata does not present any great difficulty. The inconvenience is caused by the frequency and suddenness in the changes of the weather. The latitude is of the greatest importance, and no opportunity should be lost in obtaining it either by day or night, whenever the state of the weather will admit, and, with the lead, the vessel may be navigated with safety.

In fine weather, and approaching from the northward, with north-easterly winds, the lighthouse at cape Polonio (Castillo), and Sta. Maria will be sufficient to identify the coast.

In hazy weather, a good parallel for making the entrance is on that of Lobos island, and when in the longitude of about 53° 10′ W. the La Plata bank will be struck, in depths of 12 to 20 fathoms.

The bank here is about 10 miles across, then the mud-well will be reached, in which the depth is over 20 fathoms.

Having crossed the mud-well, and steering towards the coast, the following changes in the character of the bottom will be observed: First, mud and sandy grit, next mud and shell, and finally sand and shell; the sand becoming quite coarse, changes colour, and is mixed

* *See* Admiralty charts:—Santa Catharina to Rio de la Plata, No. 2,522; and Rio de la Plate, No. 2,544.

with gravel or pebble and coloured shells as the coast is neared, while the soundings decrease somewhat regularly in depth to 14 and 12 fathoms about 4 miles from shore. In thick weather, or when all points on the coast are not plainly visible from that distance, the water should not be shoaled to less than 15 fathoms.

Proceeding seaward, and having crossed the mud-well, the character of the bottom is as follows: First, mud and sandy grit, then mud and shell, next fine gray or white sand mixed with broken shells, and beyond the La Plata bank, fine white and gray sand.

Allowance must be made for the current according to the direction and force of the wind, bearing in mind that with the wind from S.E. it sets strong towards the coast.

If set to the southward, the bottom will be fine sand.

As a vessel proceeds westward, the chart is the best guide; but mud and sand will be found on the parallel of Lobos, and muddy bottom is sure indication of being in the fairway.

Several vessels are yearly wrecked on the English bank by not paying attention to the lead and particularly to the nature of the bottom. To the westward of Lobos islet with a scant or working wind, the north shore should be kept abroad, as it is bold; there are no out-lying dangers at the distance of 5 miles from it, and the weather is seldom so thick for any length of time that the land cannot be seen. The nature of the bottom is mud, and the decrease of soundings to the westward will indicate an approach to Flores lighthouse. With a fair wind, if a vessel be to the southward, out of the channel, the bottom will be gray or black sand and shells, especially near the English bank, whilst in the channel the bottom is pure, soft, blue mud.

With a steady north-east breeze, cape Castillo should be sighted, when the vessel, aided by a favourable current, can steer along the land. If, however, the wind be from south to south-east or the weather be uncertain, by sighting the cape a vessel will be to leeward, with a strong current against her, and a heavy swell setting towards the coast. It would therefore be necessary, with south or south-east winds, to keep a little southward of the parallel of Lobos, and steer so as to sight that islet in a West or N.W. direction.

In bad weather attention must be paid to the soundings over La Plata bank, and mud-well, and the river should not be entered before a vessel's position is well ascertained by sighting Lobos or the surrounding lands.

If caught in the entrance with a south-east gale, and unable to reach a port, it will be prudent to anchor on muddy bottom, under the lee of any sand-bank. If eastward of Lobos isle, the vessel will be set rapidly towards cape Castillo, where shelter will be found from winds southward of S.S.E., on the north side of the cape, as mentioned at page 222; or she may stand off shore until the return of fine weather.

In entering the Rio de la Plata southward of the English bank the seaman should be certain of his latitude, and steer on the parallel of about 35° 35′, northward of the Rouen bank, taking into consideration the state of the wind and sea; or run on the parallel of 36° south of the Rouen, avoiding the space between, in which French bank and others have been reported. Westward of Rouen bank course must be shaped for the desired port according to position, as in the absence of marks the bottom and soundings are the only guide.

The bottom eastward of English and Rouen banks is sand sometimes mixed with shells, whilst northward of English bank, in the channel, it is mud. Westward of these banks, and of the meridian of Monte Video, the bottom is mud, with the exception of the tosca off Piedras point; and Ortiz bank, which is sand.

As cape San Antonio, the south point of entrance, is low, and seen only at the distance of a few miles, a vessel from the southward, in the absence of observations, must depend entirely on the lead; and in proceeding for Buenos Aires, the Cuirassier (Indio point) light vessel will probably be the first thing seen, at a distance of 6 or 8 miles.*

See pilots, page 266.

MONTE VIDEO to BUENOS AIRES.—It is customary for vessels from Monte Video to Buenos Aires to employ a pilot, and unless the mariner has some knowledge of the navigation of the river, it is almost indispensably necessary for those of more than 16 feet draught; for although the channel is marked by Cuirassier and Chico light vessels, at certain places it is narrow, and the light vessels are liable to be considerably out of position. The pilots alone can be acquainted with any changes, but too much confidence must

* The lights of vessels at anchor must not be mistaken for those of the light vessels, although this is frequently said to occur. Also, some care is required in selecting pilots, for although licensed by the superintendent of the port of Buenos Aires, it is to be feared there are many who are not competent to undertake the navigation of the river. Wrecks are frequent, but the pilots are seldom, or never made to feel their responsibility.—Lieutenant L. S. Dawson, R.N., 1871.

not be placed in them, and great attention should therefore be given to the navigation even with a pilot on board.*

Vessels of less than 9 feet draught can almost always steer across Ortiz bank in a direct line. In proceeding through either channel it must be borne in mind that when in the fairway the bottom will be soft mud, and the nearer the banks are approached the more the mud will be found mixed with sand, and the bottom harder, as near all the banks sand predominates. Should a vessel's position be doubtful in consequence of thick or bad weather, she should anchor. Eastward of the meridian of Flores, a vessel should anchor only during fine weather; but westward of that meridian, she may anchor without the least inconvenience, when the bottom is mud. Near the banks in the Rio de la Plata, generally, the bottom is a mixture of black mud and sand, overlying stiff clayey mud.

North channel† is frequented by coasting and other light draught vessels. Leaving Monte Video for this channel, and having passed Panela rock and the south extremity of St. Lucia bank at a prudent distance; steer about W.N.W. along the land, passing Santa Maria and Sandy points at the distance of 4 or 5 miles, and when the soundings increase from 3½ to 4¼ fathoms, a vessel will be off the bank extending southward between the two points. When Santa Maria point bears E.N.E., distant about 6 miles, a course N.W. along the shore may be taken, passing about 2 miles southward of Rio Pereyra; westward of this river the water decreases. Off the Cufre the depth is about 16 feet, which should be passed at the distance of 1½ or 2 miles.

On arriving off Sauce point, which is more woody than the others, a course about W. by S. ½ S. should be steered, so as to pass southward of Pipas rocks and the rock to the south-westward; having passed them, the land may be closed by the lead to within half a mile, steering along it for Colonia roads. The soundings, from about 4 miles west of Pipas rocks, will increase to 4½ fathoms, and at less than half a mile southward of Colonia to 7 fathoms. In rounding the point at the distance of a quarter of a mile, 6 and 5 fathoms water will be carried into Colonia roads.

If bound to Buenos Aires, steer to pass 1½ cables south of San Gabriel Island, and with its centre bearing N. by W. course may be shaped to pass north or south of Farallon island.

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† For the description of the coast bordering the north channel, with its dangers see pages 242—246; also charts, No. 1,749 and 1,751.

South Channel.—In leaving Monte Video for the south channel to Buenos Aires, steer about S.W. by W. and pass about 4 miles south-east of Indio point or Cuirassier light vessel, or even more to the southward; but as the currents which always prevail in this part of the river are variable in direction, and sometimes attain a strength of 2½ miles an hour, the course should be carefully preserved by the bearing of the Cerro as long as it is in sight, which in fine weather will be at a distance of 28 or 30 miles, by which time the direction of the current should be fairly ascertained. Although this part of the bed of the river is nearly flat, great attention must be paid to the lead and the actual course, and speed frequently ascertained by means of the ground log (*see* page 276); also a good look out must be kept to avoid wrecks.

At about 12 miles from Monte Video the depths will be about 4 fathoms, mud, decreasing to 3½ fathoms as Ortiz bank is approached, over the tail of which 17 feet, soft mud, will be obtained at low river, deepening to 20 feet on its western side; but if the Indio light vessel be not seen, do not haul to the north-westward until the water shoals to less than 3 fathoms, near Indio point. The state of the river should always be considered.

Should the soundings decrease to 16 or 17 feet, before the necessary distance from Monte Video is made good, a vessel will be near the southern shoal patch of Ortiz bank, but should they increase to 4½ fathoms or more, she will be some distance to the south-eastward, bearing in mind that, generally, the bottom is more or less soft in the channels and more or less hard near the banks. The grove of trees on Indio point is visible 13 miles in clear weather from the deck of a vessel; this, when first sighted, will give an approximate distance from it, and may assist the mariner, if the light vessel is not seen. But he must not be deceived in his distance from the land, as it may be seen by mirage at a greater distance. In thick weather it will be prudent to anchor.

The Indio point light-vessel may be passed a prudent distance on either side, then steer N.W. about 28 miles, making due allowance for the current, the direction of which will probably be seen in passing the light vessel; the ebb sets strong to the south-east, and the flood to the north-westward. When the Chico light-vessel is seen, which it probably will be after having run 18 or 20 miles, steer to pass northward of her, then a W. ½ N. course, will lead to the bar anchorage and guard ship light-vessel at Buenos Aires. Should the Chico light-vessel not be seen, in consequence of thick weather, or

being out of her proper position, skirt the edge of Ortiz bank by the lead.

Between Ortiz and Chico banks is the deepest part of the channel, the depths increasing near the latter bank. Towards Ortiz bank the depths shoal very gradually; Chico bank is steep-to. It is scarcely known of a vessel grounding on this edge of the Ortiz bank, but several have grounded on that of the Chico. From the light vessel the soundings westward are regular as far as Santiago bank, when they gradually decrease to Buenos Aires.

From the Cuirassier or Indio point light vessel to Buenos Aires, the navigation for a sailing vessel presents some difficulties, unless with a fair wind, and at all times require great attention. Between these two points, in ascending or descending the river, the seamen should not attempt to work against the current unless the vessel can attain a speed of 6 knots, if the current is beyond its normal state of one or 1½ miles an hour; it will be more prudent to remain at anchor. In working to windward, do not stand nearer than 3 fathoms on either side.

When in the vicinity of Chico bank, Ortiz bank should be kept aboard, as the former is steep-to, and must be approached with the greatest caution. When Magdalena church (if seen) or the trees bear S.S.W. a vessel will be between Ortiz and Chico banks; and with the church S.S.E., will be westward of Chico bank, and may stand farther to the southward.*

A vessel will then have no difficulty in tacking on either side of the channel at a prudent distance from the edge of the banks, bearing in mind that Santiago bank is steep-to. If bound to Colonia or the Hornos islands, steer by the lead along the edge of Ortiz bank, or with Farallon light in sight, it may be steered for bearing North. A pilot boat will probably be found about 6 miles southward of Farallon lighthouse. Directions for Colonia will be found at page 267.

Vessels leaving Buenos Aires for the south-eastward, should steer about E. ½ S. from the guard ship light vessel, careful bearings of which whilst in sight will give some indication of the set of the current. Bearings of the poplars on Santiago point, and Magdalena church and trees will assist in checking the position when approaching Chico bank. Should Chico light vessel not be seen, on account of fog or other cause, the edge of Ortiz bank should be skirted by the

* Magdalena church is only seen on certain bearings, the trees having grown up around it.

lead; and when sure of being eastward of Chico bank, steer for Cuirassier light vessel, making due allowance for set, and keeping the lead going.

CURRENTS and TIDES.—The general movements of the waters in the La Plata are greatly influenced by the direction and force of the wind. With fine weather and light breezes there is some degree of regularity in the tides, but in stormy weather the movements of the waters are entirely dependent on the force and direction of the wind. The strength of the alternate streams produced by the tides does not exceed one to 1½ miles an hour; but the current caused by the wind attains a velocity of 3 or 4 miles an hour.

The variations of the winds have such an influence on the movements of the waters, that there is nearly always a possibility of foreseeing the alterations in the weather, from a daily observation of the current and height of the water. Before the winds from seaward, are felt on the coast, the current sets into the river, and the water rises to a height in proportion to the strength and duration of the wind. At times the difference between high and low river is as much as 12 feet. For several hours, and sometimes for a whole day before a pampero, the water is seen rising in the port of Monte Video, which rising continues until three or four hours after the pampero has commenced, it is then quickly followed by a strong ebb.

The winds between N.N.E. and W.N.W. cause the river to fall the lowest; the down current is then stronger along the south coast, but it seldom exceeds 3 miles an hour; on the north bank it is inconsiderable.

When the wind has been from the north-east for some time, (and occasionally before the north-east wind arrives), the waters flow to the westward along the north coast, whilst they are falling and running to the eastward along the south coast; and during the time the wind remains between S.E. and N.E., the current flows generally to the westward beyond Monte Video, without much increasing the depth to that point while it fills up the river above the banks.

In fine weather, a portion of the waters from the Parana and Uruguay run to the eastward along the northern shore, east of Colonia.

When gales from the north, or winds from the north-west to east prevail, the river falls considerably, and the current runs to the south-east and south; and when pamperos prevail, the river rises and the current flows to the north-west, west, or south-west, according to

the direction of the channels. During the months of March, April, and May the Rio de la Plata is higher than in the other months of the year, on account of the rising of its tributary rivers, which bring down trees, brambles, and weeds, formed into masses like islets, sometimes large enough to support four or five men standing, and known by the natives under the name of camalotes. During fine weather, without wind or other apparent cause, the river may fall or rise considerably.

If the water rises for a longer time than the duration of a tide, in a calm or light breeze from N.W. to S.W., it may be inferred that the wind will blow from N.E. to S.E., and that it already blows from that quarter at sea.

At the mouth of La Plata in the vicinity of English and Rouen banks, in the months of August and September, the currents were found to set in all directions, but generally more towards East and West, than to the North and South. The greatest rate observed did not exceed 1½ knots an hour.

Northward of English bank the currents are stronger, but variable in direction; easterly prevail, with a strength of 2½ knots.

A current has, however, been found running to the eastward at the rate of 5 miles an hour, at 5 miles W.S.W. of Lobos isle; and a vessel has been set in one night from Lobos isle to the northward of cape Castillos; also a vessel in sight of Piedras point found the current setting S.E. 4 miles an hour. When there has been an unusual flood in the inland countries, and the sea is at low ebb, or when the spring tide is unusually high, and the river is the reverse, the current may set round cape San Antonio at least as strongly as it has been known to run past Lobos islet. These, however, are extreme cases, of rare occurrence.

It is likely these strong currents do not extend beyond the limits of the soundings, where they must lose their strength.

Off the entrance of the La Plata the current generally sets to the N.N.W. before and with southerly winds, and to the S.S.E. before and with northerly winds, at rates varying from one to 3 miles an hour. An east and E.N.E current of one mile an hour, a supposed outfall from the La Plata, has been experienced, extending to longitude 40° W.

Between Santa Catharina island and the La Plata, the current generally sets to the southward with N.E. winds; a rate of 40 miles

has been experienced in 24 hours. S.E. winds force the current to the shore, with a heavy sea.

GROUND LOG.—From what has been said of the irregularity of the currents in the La Plata, and the importance of knowing a vessel's position, it will be easily seen how useful the ground log may be made, which alone in the absence of land, &c., can indicate the strength and direction of the current; but notwithstanding its simplicity we fear it is seldom in use. We cannot call too strongly the attention of the mariner to this subject when the depth of water will admit of its use. The very smallest line that will haul in a lead of 5 or 6 pounds weight is the best. The lead should be rounded, long, and tapered at each end, in order that it should sink fast and be hauled in easily.

The lead may be also made fast to the logship, without the peg being fixed in it, and thrown overboard; the lead taking it to the bottom will prevent it coming easily home to the ship. In this manner it is clear that the log-line will show the distance run by the ship, both from the effect of the wind and current. Having noted the number of knots, make the line fast, so that it may be upon a strain. Set the bearing of it by compass and the opposite point will be the vessel's point made good. There can be no doubt of the course and distance obtained in this manner being as correct as if there were no current. If the log be hove in the usual way, and the distance shown by it, and the vessel's course by compass, be compared with the course and distance shown by the first mode, sufficient data will be obtained to find the force and velocity of the currents.

WINDS.—One of the distinctive features of the climate of the La Plata is the frequency and rapidity in the changes of the weather; but these changes depend on certain laws which facilitate the means of foreseeing them. The general law regulating these changes here, as well as in the other parts of the southern hemisphere, is that the ordinary change in the wind takes place from right to left, or contrary to the movement of the hands of a watch. Therefore the wind generally backs from north to north-west, to south-west, to south-east, &c., &c., whilst in the northern hemisphere it veers from left to right.*

* The terms "veering" and "backing" applied to the wind, may be explained with reference to the movements of watch hands, the former signifies shifting in the same direction as the hands, and the latter in the opposite direction, and they have the same meaning in the two hemispheres.

The prevailing winds differ according to seasons.

During the summer months, from September to March, the winds prevail from the eastward. The atmosphere is then pretty clear, but thick near the horizon, and the land is difficult to be seen. In the offing, the wind blows from the north-east, hauling gradually to the east in approaching the river. Within the river during this season, the winds generally back round the compass in twenty-four hours. A fine steady breeze blows from the south-east during the afternoon, in the evening it is from north-east, and during the night from north. At Monte Video this afternoon breeze is called brizas. Often fresh gales prevail during the night.

On the following morning it backs to north-west and west, or else calms prevail until the wind springs up from the southward or sets in from seaward about 11 a.m. This wind is called virazon. When it fails, or the wind from north or north-west continues to blow, squalls more or less heavy may be expected from the south-west. A few days of tolerably fine weather are often followed by clouds, rain, and strong breezes, but it is difficult to foretell from which quarter they may come.

Should it be from the northward, a continuance of bad weather may be depended upon; as, unless the wind is from the southward, there is no duration in the fine weather, although it may appear likely to last. The more clouds, rain, and wind from the northward, the more it will blow hard from the southward.

During the hot summer months, when it does not rain sufficiently to cool the atmosphere, the winds from the northward are nearly suffocating, and produce a dry, oppressive, debilitating atmosphere, which affects both man and beast in a way that would scarcely be credited by those who have not felt them. These winds last about three days, and are always accompanied by a depression of the barometer, which falls in proportion to its strength; whilst blowing the atmosphere is loaded with electricity, a storm invariably follows, during which the wind backs to the south-west.

When it blows from the southward the weather is cool and agreeable; there is, however, a marked difference between south-east and south-west winds; the former, although cool, are damp, as are all winds from the eastward; but the south-west winds bring the most clear, elastic, refreshing atmosphere that can be imagined, and the climate of Rio de la Plata, whilst the wind is from this quarter, can hardly be surpassed. A little time before the new and full moon,

there are often strong breezes from the south-east, with rain; but sometimes it blows from the northward, not so hard as from the south-east, and the temperature is higher. The pamperos or south-west winds seldom prevail at this season.

During the winter months, from March to September, the most prevailing winds at the entrance of the La Plata are from west to south-west; and in the river they are oftener from north than south or west. At that season, when the weather is really fine, the wind backs round the compass as in the summer; but in ordinary weather it happens only once a fortnight, taking place, as already mentioned, from south to east, north, and west. The winds from north blow with rain, lightning, and thunder; it hails at the first with south winds. With the wind from the east there is an abundance of rain. When the wind backs as above, fine steady weather may be expected; but if in a contrary way it is nearly a certain sign of bad weather.

During the months of June to October the squalls from south-west or pamperos prevail the most; at that time the winds are variable, with squalls, calms, and rain. When the wind is from the east, with squalls, it is generally followed by those from the west, with squalls, and vice versâ, and the weather sets in fine again only when the wind backs either to the north or south according to its rotation. Thus the wind begins at west, backs to the south and south-east, blows rather strong at east and north-east, changes to the north-west in a squall, and the weather becomes fine again only if the wind settles in the north.

During both summer and winter the winds from north-west bring hot, rainy, disagreeable weather; those from the south, when the first squalls over, bring rain and cold weather; and those from the west, dry, hot, pleasant weather.

In the winter the winds from the south have the character of lasting squalls, whilst in the summer they are of a shorter duration, but more sudden and violent.

Pamperos.—The bad weather in the La Plata sets in with the wind from S.W. or S.E. July, August, and September is the season of the pamperos. The winds from the south-west, whether strong or light, are called pamperos, from their blowing over the pampas before reaching the coast. They may be divided into two classes; the general and the local pampero. The local pampero is of short duration, and should it blow hard the weather is clear. The general pampero, on the contrary, is accompanied with rain and

storms. It descends from the Cordilleras, passes over the pampas, generally lasts for three days, and is known in the La Plata by the name of pampero sucio, or dirty pampero.

They set in generally with a strong squall from the westward, which darkens the horizon, and is followed by other heavy squalls of wind, rain, hail, and thunder; soon after the sky becomes clear, the wind remains, becomes cool and backs to the S.W. and S.S.W. By attention to the barometer and the state of the atmosphere, the coming of a pampero can generally be foretold, but sometimes the signs of bad weather end in a short squall with thunder and lightning, which soon passes away. A vessel from the northward on reaching the parallel of 31° or 32° S. will be in the vicinity of the pamperos; they are felt as far as 48° W., and between the parallels of 31° and 40° S. These squalls are dangerous, as they are sudden, but their violence has been exaggerated, and they are no more to be dreaded than the heavy squalls which are met with in other parts of the world.* Let not the sailor, however, by these remarks be thrown off his guard.

The different circumstances which generally precede a pampero are:—Interruption of the regular daily and nightly breezes. A series of north winds, with great heat and suffocating atmosphere. Fresh breezes from N.W., followed by unsettled weather, then by a North wind, freshening and backing to N.W., with haze or a little rain; if in this case it should be hazy with lightning in the S.W. a pampero is certain. A great depression of the barometer for several hours and sometimes entire days. The rising of the water of the river. The presence of myriads of insects in the air, and a kind of white filament resembling spider's web. And, lastly, the extreme clearness of the atmosphere, which admits the cerros of San Juan to be seen from Buenos Aires, and other objects at a great distance.

As soon as the pampero blows, the temperature becomes cold; its duration in winter is generally from two to three days, it may last five or six, but very seldom. In summer it is less frequent than in winter, does not last so long, but blows with more violence. It is known then by the name of turbonada, as after a few hours it veers to the S. and S.E., losing all its force. In the winter it often backs to South and S.E., when it blows in squalls for several days; it being then foggy with rain, and consequently the coast is not easily

* The pamperos have now and then assumed the violence of heavy gales, but the occurrence is more and more rare; all frequenters of the La Plata agree that the violence of the pamperos has been continually on the decrease since the present century

seen. When it comes on with a clear sky it lasts longer than in cloudy weather. Should it continue raining whilst the wind backs to South and S.E., it is a sign of the pampero will last, and that fine weather will be preceded by squalls from the S.W.

If on the rising or setting of the sun the wind should lull occasionally, it is a sign of an early change or less wind, and if it freshen again it will only be for a short time. When the pampero is about to abate. the atmosphere becomes clear, and the wind veers to West. The weather is generally bad at the end of August, and there is the same regularity in the change of weather as there is about the time of equinoctial gales in the English channel.

There is a prevalent idea amongst the inhabitants, that a heavy gale annually occurs on Santa Rosa's day, the 30th August, and it seems pretty certain that within a few days of this date, dirty weather often does come on.

South-east winds. — These winds blow with much force, cause a heavy sea, and a strong current to the N.N.W.; they are known in the country by the name of suestadas, and are more dangerous as they prevail on a coast without shelter, accompanied with fog and rain, which prevents the land from being seen. They are anticipated by a great rise in the barometer, cloudy threatening weather with lightning, and a red sky on the rising of the sun; the the water in the La Plata and on the coast becomes high, and a strong current flows into the river.

Barometer. — The rise and fall of the barometer will generally indicate the changes of the weather, though it may frequently happen that the oscillations may be the same with opposite winds; it must therefore be consulted with great regularity. The general rule is, that it rises with easterly winds and falls with westerly winds; but with bad squally weather it invariably falls, from whatever point the wind may be blowing. The greatest mean height of the barometer takes place in August and September; the lowest in the months of January, February, and June. The highest range may be about 30·6 inches, and the lowest 29·3 inches.

In fine weather the mercury falls a little for east and south-east winds, and rises again when they are settled, falling again for westerly winds. If with westerly winds the barometer continues to fall, it may be inferred that it will blow again from the east. With the wind from S.E. to N.E., immediately after a storm, or as soon as the weather is clearing up, it is not long without rising and

remaining sometimes very high as long as the strong winds from S.E. prevail; if, on the contrary, the barometer continues falling, and especially if it should become cloudy in the S.W., a pampero may be expected. The fall which precedes bad weather is generally a great deal slower than the rising which takes place when the weather is clearing up.

Thermometer. — The mean temperature in the La Plata is about 65°, but the changes of the temperature are as sudden as the changes of the wind. The extreme thermometrical limits are from 32° to 88°. The highest temperature is in the first fortnight of February; the lowest in the first fortnight of July. The thermometer rises with north winds and falls with south winds. It seldom snows, but in fine winter nights the ground becomes covered with hoar frost, and the stagnant water with a slight coating of ice, melting with the first rays of the rising sun.

Rain.—The rain is very irregular in the La Plata: it falls more frequently during the spring and autumn than in the other two seasons. May and October are the two months when it rains the most; it is more frequent during the night than by day.

As the difference of temperature between night and day is always considerable, the vapour dissolved in the atmosphere begins to condense as soon as the sun has set, when the dew falls by its own weight; and it often happens in clear weather that it looks like thin rain.

Fog or **Haze.**—During the winter months of July, August, and September there are thick fogs, especially from the entrance of the river to Ortiz bank; they are not so intense farther up. At Buenos Aires they seldom last more than a few hours.

Lightning is extremely frequent during the summer, and indeed all the year round it is more frequent in the La Plata than in most other parts of the world. Vessels' masts, churches, and houses are often injured. These accidents, however, do not take place so often as from the frequency and vividness of the lightning might be imagined.

Mirage or **Refraction.**—In the Rio de la Plata there is considerable refraction, and more so in the tributary rivers. It often happens that objects above the visible horizon disappear; others below the horizon appear and are clearly seen at great distances. At

Buenos Aires the cerros de San Juan, below the horizon, on the Oriental coast, a distance of 36 miles, are sometimes seen. When this is the case the atmosphere is extremely clear, and it is a most certain sign of bad weather.*

URUGUAY AND PARANA APPROACH.†—The approach to these rivers lies between the coast northward of Colonia and Hornos islands, and Palmas flats, and is named the Martin Garcia channels.

The COAST.--The eastern shore from Manuel point, opposite the Hornos islands, trends in a north-west direction for about 23 miles to Martin Chico point; the coast is slightly elevated, rising into hills from 100 to 120 feet high. The chief features are the ombu tree of San Pedro, and the river of the name north of it; also the ombu tree and river of San Juan, and 6 miles inland the Cerros de San Juan.

The Cerros de San Juan are three peaks of the same hill, which forms the culminating point of this coast; they lie 17 miles N.N.W. of Colonia, and at 6 miles from the coast. The northern peak is 445 feet high, the middle 350 feet, and the southern 370 feet. They serve as a useful landmark to navigation over this part of the river, and in clear weather may be seen from the tops of the houses in Buenos Aires, a distance of 33 miles. When so seen, it is generally considered a sign of bad or wet weather.

MARTIN GARCIA ISLAND stands boldly up in the channel 25 miles N.W. by W. from Colonia; it is a mass of granite, almost circular, with the form of a flattened cone, 82 feet high; it is about 2 miles in circuit, with its shores rocky except on the north-west part, where there is a small beach and a landing place. Its position between two narrow channels which lead to the great rivers Parana and Uruguay renders it a strategic post of some importance, as in going up or down a vessel must pass within half a mile of the islet on the south side, and within less than one mile by the Canal del Infierno. There is a battery and a granite pier at the south-west point, and a small garrison; also some workers in the quarries, as the stone is good for building and paving.

* Colonia lighthouse, and vessels at anchor there, have been plainly seen at a distance of 30 miles.

† *See* Admiralty chart:—Sauce point to Martin Garcia island, No. 1,751, scale, $m = 0{\cdot}9$ of an inch.

A good lazaretto has been built on Martin Garcia, capable of accommodating a large number of people.

Telegraph.—Martin Garcia is connected with the adjacent main land and Buenos Ayres by a submarine cable; two iron conical buoys, with flag, and marked telegraph, show the direction of the cable. One is placed about half a cable distant from the landing place of the cable on the island, and the other near the landing place on the main. Definite positions not known. Anchorage is prohibited in the direction of the cable.

LIGHT.—From a lighthouse erected on the summit of Martin Garcia island, is exhibited at an elevation of 141 feet above the level of the river, a *fixed* white light, which should be visible in clear weather from a distance of 14 miles.

Beacons.—Two beacons are placed on Martin Garcia for the purpose of guiding vessels through the channel; one named Farol mast, near the centre of the island; the other a white beacon near its south-east end. These, when in line, lead between Santa Anna and Middle banks.

CHANNELS.—There are two passes or channels to ascend the river above Martin Garcia, one to the south-west, the other to the north-east of the isle. The former is named Martin Garcia channel, the latter the Canal del Infierno, from the difficulty formerly of navigating it. These channels are marked by buoys, but their positions must not be depended on. Vessels of about 14½ feet navigate these channels, and occasionally vessels of 16 feet use the Canal del Infierno.

MARTIN GARCIA CHANNEL, about 17 miles long, and half a mile wide, is formed on the west side by the extensive bank named Palmas flat, which blocks up two-thirds of the area of the river, and on the east by the St. Anna and other detached banks, which extend to the south-eastward from Martin Garcia; and between which it would be difficult to navigate without a beacon always in sight, not only to point out the route, but also to show the variable set of the current.

Buoys and Beacons.—The buoys and beacons in Martin Garcia channel are altered to meet the constant change in its direction, and are not to be depended on in their charted positions.

The pilots state that this channel is little used, and is not navigable for vessels drawing more than 8 feet.*

Two wrecks lie in the Main channel, near the western edge of Santa Anna bank, respectively S.S.W. ¼ W., distant $3\frac{9}{10}$ miles, and S. by W. ¼ W., distant 4 miles from Pareda point.

Directions.†—The following directions, consequent on alterations in the channels, must be used with caution, and is is advisable to employ the services of a pilot :—Vessels bound through Martin Garcia channels to the Parana or Uruguay rivers, may pass about half a mile west of Farallon islet, and then steer N.N.W. (avoiding Beaumanoir and Hornos banks), until Colonia church is in line with the western Hornos island, one-third from its western end, bearing S.E. by E. ¼ E., then with this bearing astern it will lead up to the first black buoy, distant 7¼ miles from Hornos islands, leaving it on the starboard hand. Continue the same course (N.W. by W. ¼ W.) passing either side of the bar patch, marked by a red buoy with flag on its northern end (the fairway buoy), and a black buoy on its southern end, until the north top of a white remarkable sand-hill comes in line with the north summit of the Cerro de San Juan, bearing N.E. ½ E, then steer for Martin Chico point until Farol mast and the white beacon (both on Martin Garcia) are in line N.W. by W. ½ W., then steer with these beacons in line, which will lead to the northward of the middle bank and southward of the flats extending from Martin Garcia island. Abreast the Fairway buoy it is difficult to see Hornos islands or Colonia, the lead and the beacons (sometimes washed away) must be the principal guides. If no beacons are seen anchor.

Having passed through the Middle bank channel, steer to pass about 2 cables westward of the south point of Martin Garcia. The edge of the banks are generally shown by a ripple.

Having passed Martin Garcia, steer about W. by N. ½ N., observing that the beacons in line, on Martin Garcia, lead southward of the shoal extending from that island, and haul up the main channel, with the tree on the fall of the hill at punta Gorda in line with Juncal island (punta Gorda bluff will be just in sight), this course will lead between Dos Hermanos and Herradura banks, and when the Boca de Guazu is well open, or the village of Las Vacas (Carmela) bears about

* A new channel carrying 15 feet at low water has now (1893) been dredged to the north-west of point Pareda. It is marked by red buoys on the starboard side in entering from the sea, and by black buoys on the port side.

† *See* also directions for Rio de la Plata from the sea, pages 268-274.

E. by N. ½ N., course may be altered either for the Boca de Guazu (Parana), or the Uruguay.*

CANAL del INFIERNO, which passes to the north-east of Martin Garcia, is reported to have better water than the channel south of the island, and is used by vessels drawing as much as 16 feet, but the current is stronger, and may be 3 miles an hour. Approaching Martin Garcia with Farol beacon in line with white beacon, bearing N.W. by W. ½ W., the red buoy with flag, on the south-east extremity of Marcia Garcia flats, must be left on the port hand, and the buoys marking the south-west extremity of Santa Anna bank, on the starboard hand; the course through being about N.N.W. ½ W. With Farol beacon bearing West, 2½ miles, course may be altered to N.W., and when Carretas rock, southward of Martin Chico point, is in line with the south Cerro of San Juan bearing East, steer with that mark astern, until Farol beacon bears S.W.; thence a course N.W. by W. ½ W., until the south Cerro of San Juan is in line with, or a little shut in on Martin Chico point bearing East; this mark astern leads through the channel, until the leading mark tree on punta Gorda is on with Juncal island, when steer up the channel with this mark until the entrance to the river Parana is open, or the town of Las Vacas bears about E. by N. ½ N., as before directed.

It is needless to say that neither of these channels should be attempted in foggy weather or by night. Here, as elsewhere in the La Plata, the height of the water depends on the force and direction of the wind; it rises 5 or 6 feet with south-east and south winds, and falls with those from the opposite quarter. A vessel at anchor lies with her head up the river.†

URUGUAY RIVER.—The entrance of the Uruguay is 18 miles N.W. ½ N. of Martin Garcia; it is formed on the west by the mangroves of the delta of the Parana, and on the east by some high ground terminated by two principal headlands, Punta Gorda, a

* *See* Admiralty chart:—River Uruguay, Part I., No. 1,938, scale, $m = 0{\cdot}9$ of an inch; and Index chart to the Parana and Uruguay rivers, No. 2,039, scale, $m = 0{\cdot}5$ of an inch. A table of distances of important places in the Uruguay, Parana, and Paraguay will be found at page 295.

† The mariner when bound up, or loading in any of the rivers, should take into consideration the vessel's draught, and the probable rise and fall of the river, or he may be detained for months. In 1870, H.M.S. *Cracker*, drawing 8½ feet, was detained at Corcordia in the Uruguay, three months (June, July, and August) waiting for the river to rise; in some of the shallow passes there was a depth only of 6 feet.

wooded bluff 85 feet high, to the south, and Punta de Chaparro on the north, 5 miles apart. The river here is narrowed to about a mile in breadth, and varies from 12 to 15 fathoms in depth.*

Southward of these points are two villages, one, Las Vacas, near the outlet of a river of the same name, and opposite the mouth of the Parana Guazu ; the other, Las Higueritas or Nueva Palmira, in the strait of the Uruguay, where is a pier and some coasting trade.

The great mouth of the Parana, known commonly by the name Guazu, opens out into the Rio de la Plata at 12 miles N.W. of Martin Garcia, and 6 miles southward of the entrance to the Uruguay ; flowing from the westward ; all this western coast is formed by low marshy land covered with wood and impenetrable mangroves, and intersected by numerous channels, which are so many branches by which this great river flows into that of the La Plata.

The aspect of the Uruguay is altogether different from that of the Parana. In the lower part of its course between Chaparro point and Fray Bentos, a distance of about 50 miles, the river is 5 miles wide, and has the appearance of a lake. It is encumbered with flats, but there is a navigable channel running through, which enables nearly all vessels that can pass Martin Garcia to reach Paysandu, about 110 miles above Chaparro point, the entrance to the river. Above Fray Bentos the river narrows rapidly to half a mile and less.

The right bank, Entre Rios, is generally low, wooded, and as monotonous as the low shores of the Parana, the land here and there ranging, perhaps, to 180 feet at the highest. This bank being low and swampy, the principal towns of Entre Rios are from 6 to 9 miles in the interior, whence the commerce of the province is carried to the Uruguay by the facilities of its affluents, the route to Buenos Aires being much shorter than that by the Parana. The left bank, that of Banda Oriental, is composed of pleasant hills reaching occasionally from 200 to 500 feet high, broken by numbers of rivulets, with receiving houses at certain points connected with the estancias and villages, from which the produce of the country is exported.

Height of river.—The river is subject to periodical rises, occasioned by the great rain in springs in the Brazilian provinces, where it takes it source. In rises in September and attains its maximum height in November, after which it falls very rapidly. In

* *See* Admiralty chart :—River Uruguay ; Martin Garcia to Paysandu, No. 1,938. scale, *m* = 0·9 of an inch.

places where the river is narrow, it attains the height of about 30 feet, and above Salto 15 feet.* A strong southerly wind will, when the river is low, cause the water to rise a few feet, up to within 20 miles of Salto. The strength of the current depends upon the height of the river, and during a high river runs from 2½ to 4 miles an hour; at other times from a half to 1½ miles an hour; and is then much influenced by the winds. The prevailing winds are from the northward, generally following the course of the river, as in the Parana.

Mercedes.—About 50 miles above Martin Garcia, on the left bank of the river, the Rio Negro joins it. The town of Mercedes, 30 miles up the Rio Negro, visited by the boats of H.M.S. *Cracker* in 1874, is stated to be clean and healthy.

Fray Bentos.—A place much frequented by foreign vessels is Fray Bentos, which serves as a port for Gualeguaychu. In this part of the river, which is 6 miles in breadth, the channel is very near the eastern bank. The little river Gualeguaychu, leading to the town of the same name on its right bank, is directly opposite Fray Bentos. This river is about 10 miles in length, with a bar at its entrance; vessels of light draught ascend when the water is a little above the average height, which is always the case when the wind is from the southward. The difficulty of reaching Gualeguaychu renders the operation of loading and unloading very tedious. The produce is hides, tallow, bones, and jerked beef. Here all vessels may lie, that can pass Martin Garcia flats.

Concepcion del Uruguay.—The next port is Concepcion del Uruguay, situated 12 miles below Paysandu, and about 45 miles above Fray Bentos. Vessels can approach to a cable distance from the quays. The little river of Concepcion admits vessels of light draught. Here is embarked the produce of the estancias in the district.

Paysandu, a town of 12,000 inhabitants, about 57 miles above Fray Bentos, ranks next to Monte Video in the Banda Orientale. It has a custom-house and piers, and is in telegraph communication with other important towns. During the greater part of the year it is accessible to vessels of 14 feet draught, although at times there is not more than 6 or 7 feet water on the bar, and vessels have been detained for about three months outside.

* The difference of the height of the river at Salto in January and June 1865 was 10 feet.

Several Englishmen own estancias (farms) in the neighbourhood.*

Exports and imports in 1881 were about 165,000 tons each.

Concordia and Salto are situated about 75 miles above Concepcion; Salto Grande is 17 miles higher up the river. Beyond Salto the river is only navigable for very small craft, as the channel is nearly closed with rocks.

Between Salto and Herrideros rock, 15 miles below, the bottom is rocky, and is dangerous to ground on.

A regular weekly communication is established between Buenos Aires and the principal towns of Uruguay, as far as Salto.

PILOTS for the Uruguay are usually engaged at Monte Video or at Buenos Aires, but sometimes they may be obtained at Concepcion, a place where a large number of foreign vessels trade to. No vessel should attempt to navigate this river without one.

Supplies can be obtained at all the towns near the banks of the river. Coals are scarce, but wood, which answers well for steaming purposes, may be obtained.

PARANA RIVER.†—The Parana and its affluents are subject to a periodical rise, which then permits vessels of 12 or 13 feet draught to reach Corrientes, and those of 7 feet draught the Brazilian province of Matto Grasso, in lat. 18° S., at about 2,000 miles from the sea. The rise or swelling of the river is produced by a double cause; the melting of the snow on the Cordilleras, whose water descending to the Parana by its affluents from the westward, and by the great rains which fall at nearly the same time in the Brazilian provinces, reaching the Parana by its affluents from the eastward.

During low river it is navigable to Corrientes for vessels of about 7 feet draught, and for vessels of smaller draught to the Salto d'Apipe, 135 miles farther on, in lat. 27° 30′, where the last rapids occur. It has a low and high season, depending on the periodical rains; the low season is said to last during the winter and spring of the southern hemisphere, from June to December, and

* H.M.S. *Swallow*, visited Paysandu in July 1880, drawing 12 feet, and although there was sufficient water to have reached Concordia and Salto, the pilot did not consider it prudent to attempt it, as the river occasionally falls suddenly. It is considered that a vessel of that draught could get down from Concordia as late as August.—Remark Book of Commander J. B. Warren.

† *See* Admiralty charts:—Parana river, from the Boca de Gauzu to Corrientes in 3 sheets, No. 1982*a*, *b*, *c*, scale, *m* = 0·8 of an inch.

the high season during the summer and autumn; but the difference in the height of the river in these seasons varies at different times and in different parts.

In the lower part of the river, the water rises occasionally when the wind blows strong from the south-east, which forces it back; but this rise lasts only while the wind is from that quarter, as it falls again when it veers to northward or westward. During a very low river the sand-banks forming the port of Parana have uncovered 5 feet, and in a very high river the water has been known to rise to the level of the quays at Corrientes.

The Parana is lowest in the month of December. It rises in January, February, and March, attaining its greatest height in the latter month. In April, May, and June it is apparently steady. In July, August, and September it falls and rises irregularly. In October the great fall commences, from one to four inches per day, continuing to the latter part of December, when it begins to rise again at about the same rate. The difference between high river and a low one is about 12 feet; but it is irregular and varies considerably, depending much on the quantity of rain that falls in the Brazilian provinces, and the melting of the snow on the Andes. For example, in November 1860, the least water in the passes below Asuncion, was 16 feet, whilst in December 1861 the least water was about 8 feet.

Current.—In the navigable part of the Parana, from its mouth to the province of the Misiones, the average strength of the current is from 2 to 2½ miles an hour, it is most rapid in the narrows, and where it runs along by the high cliffs, and on the contrary weakest when it flows between low inundated banks.

San Nicolas.—The town of San Nicolas, with a population of about 12,000, stands on the right bank of the river, about 110 miles from the entrance of the Parana Gauzu, and exports about 250,000 frozen sheep to England, annually. It may be approached by either channel. The upper is almost blocked, all vessels enter by the lower channel, unless of very light draft. There is a pier alongside which vessels load and discharge; and good anchorage in 9 fathoms, close to the shore. H.M.S. *Flamingo*, 1888, found good anchorage in 6 fathoms, water, abreast the cathedral, on the starboard hand entering, it is necessary to anchor on this side, to leave a clear channel for small craft and river steamers, also to avoid the strength of the current. Vessels of 17 feet draft can lie alongside the bank

and at the pier at the frozen meat establishment. Vessels intending to proceed higher up the river anchor outside the islets. Supplies are cheap and plentiful.

Rosario.—The principal port for foreign commerce on the Parana is Rosario, a thriving town about 40 miles above San Nicolas, with a population (1892) of about 50,000 inhabitants. Vessels of 17 feet draught can navigate to Rosario when the river is high, and in general all those that can pass Martin Garcia; sailing vessels do not usually go beyond Rosario on account of the difficulties of navigation. There are piers with a depth of 17 feet alongside, for discharging cargo, but the harbour, from the want of dredging machines, is reported to have been much reduced in depth in the last 10 years.

Coal may be obtained from a hulk moored in the river. About 2,000 tons of coal is usually kept in stock at Rosario. Coal can be put on board by lighters, at the rate of about 120 tons per day. On emergency, coal can be obtained from the Central Argentine Railway Company at cost price. Vessels proceeding up the river should coal at Rosario, as it is cheaper and more plentiful than at Parana, Le Pez, or Ascuncion. The railway company has a factory, where repairs to engines may be speedily effected; supplies are plentiful, at moderate prices.

Communication.—There is telegraphic and railway communication with Buenos Aires and other places.

Anchorage.—The anchorage at Rosario is in 8 fathoms water, at a distance of about one cable from the shore; vessels may haul alongside the wharf. The port is stated to be gradually filling up, as in the last 12 years an island or sand-bank has sprung up a little above the town, and banks are reported as having formed where formerly there was plenty of water. The current runs from 2 to 3 knots an hour.

Santa Fè, the capital of the province of that name, stands on the north-east bank of the Salado at its junction with the Parana, about 90 miles north of Rosario, and has a poputation of about 10,000. Steam vessels from Rosario call twice a week, and a steam ferry crosses the river to the city of Parana. Santo Fè is connected with the port of Colastine, a distance of 25 miles by rail.

Parana.—The town of Parana, situated about 90 miles above Rosario, is the capital of the province of Parana, and has a population

of about 18,000. Vessels of 10 feet draught can reach Parana throughout the year.* In 1882, 96 ocean vessels and 289 coasters entered the ports of the province, and about the same number cleared; the value of the exports, also the imports, were about 1¾ million milreis.

The temperature at Parana is lowest in June and July, when it rises after sharp frosts in the morning from 30° to 56°. The hottest months are December and January, when the thermometer ranges from 95° to 54°.

Large quantities of game may be shot on the shores of the Parana.

Coal.—At Parana, coal is kept for the river steamers, but the supply is uncertain and expensive. Hard wood, a good substitute for coal, can be obtained at any place above Parana.

Hernandaria point.—At about 45 miles above the town of Parana on Hernandaria point, is a Swiss colony of about 350 inhabitants, with a mission establishment, and an Argentine meteorological observatory.

La Paz, situated about 80 miles above the town of Parana, has about 2,000 inhabitants. The anchorage is in about 10 fathoms water.

Coal may be obtained at La Paz at about 3*l.* per ton. About 200 tons of coals are kept on board the hulk.

Alexandra.—An English colony named the Alexandra, is established about 70 miles above La Paz, distant about 15 miles from the banks of the river; visited by H.M.S. *Rifleman* in 1883.

Corrientes.—Anchorage.—The anchorage off the town of Corrientes, in from 8 to 12 fathoms, is not good; the current is strong and irregular, averaging 3½ miles or 4 miles an hour, so that it is necessary either to moor or to lay out a hawser to the shore.*

Directions.—It would be difficult to give any specific directions for the navigation of the Parana, where in places the channels vary much every year. There are many islands formed where deep water was found years ago, and there are now deep and good passages where none formerly existed. The charts should therefore be considered merely as sketches of the river. It requires constant practice, care, and great attention in navigating this river. Hands should be

* The least water obtained between Parana and Corrientes in June, 1881, was 13 feet, in the Chimbolan pass, about 45 miles below Corrientes; but the river was considered high.

kept by the anchor, and attention paid to the lead. It is navigable for a steam vessel of 12 feet draught for a considerable distance at all times of the year. A vessel should anchor at night in a broad part of the river, where the current is not so strong, and the banks more shelving than in the narrow parts. When going against the stream, should the vessel pass the land at a rapid rate, she will be out of the channel, and in the eddy. Avoid rushes, ripples, and smooth patches; whenever the river takes a sudden turn, open the reach before entering, or keep on the concave side of the river; and in case of a doubtful passage the seaman will know best how to act.

Keep nearer the upper than the lower bank; for should a vessel get ashore on the upper bank, she can easily haul off; but if on the lower bank, a bower anchor must be laid out up the river, and the cable hove taut, when, after a few days, the bank will wash away, and the vessel will float in most cases without being strained the least. If a vessel take the ground in ascending the river, she is easily got off again, but if descending, if she once touches, she remains fast. It is very common to hang an anchor astern in descending the river, to let go the moment the vessel touches the ground.

The only part of the river a vessel can navigate at night without great inconvenience is between the Boca de Guazu and Rosario, the shoals being few in number and the route easy to follow, but the descent at night is always dangerous, and should not be attempted unless in cases of urgent necessity. Sailing vessels cannot navigate at night.

Steam vessels of 12 or 13 feet draught can, with high water, reach the Paraguay, but those above that draught cannot proceed above the passes of San Juan, about 10 miles above La Paz. The pilots usually examine these passes by boat before proceeding through with a vessel, on account of the constant changes.

Parana de la Palmas, is the southern branch of the Parana river, joining the main stream at San Pedro. The channel which leads into the Parana de las Palmas, or Campana river, is named Boca de Campana. The river is very crooked, but deep on both sides, the only dangerous spot being about 25 miles above Zarate, called Antonio point. Here the river turns at right angles, and on the starboard hand going down are sunken rocks. Here there are whirlpools, and the current sets on the rocks; in light winds sailing vessels must be dropped down, stern first. Steam vessels of considerable draught proceed to Campana and Barredro by this branch,

entering from the main stream.* The entrance to Parana de la Palmas is about 18 miles north-westward of Buenos Aires, across Palmas flats.

H.M.S. *Cracker* descended this branch in May, 1875, turning into the Capitan branch, and thence through the embouchure of the Lujan river to the Rio de la Plata. The vessel grounded several times on soft mud. In some places, in the Tigre, the channel was scarcely broader than the length of the ship, and extremely tortuous. The mouth of the Parana de la Palmas although comparatively deep, is avoided on account of the difficulty in keeping the channel over Palmas flat, which is not buoyed ; whereas the route by the Capitan can be taken without buoys.

PARAGUAY RIVER.—The Paraguay like the Parana has periodical rises, but the time is a little different. It commences to rise towards the end of February, and continues until June, after which it begins to fall. Its rise is very irregular, sometimes the high river taking the place of the low one until within 90 miles of its mouth. The difference in level between low and high river is also variable ; it is on an average about 9½ feet, but on one occasion it reached 14 feet, which occasioned great loss to the inhabitants.

During the average rise, vessels of 12 feet draught can reach Asuncion ; those of about 9 feet draught can reach it the greater portion of the year ; but during low river those only of about 6 feet can reach it. In favourable seasons, vessels of about 7 feet draught are able to go as far as the San Lorenzo and Cuyaba rivers (about 1,500 and 1,600 miles respectively, above Buenos Aires), and those of less than 5 feet draught can reach the town of Cuyaba, nearly 1,900 miles from the same place. Asuncion was visited by H.M.S. *Rifleman* in June 1888, with a draught of 9¾ feet ; and the *Cracker* proceeded 140 miles beyond Asuncion, to within 8 miles of Villa de Concepcion, drawing 7 feet.

Villa Pilar.—At about 50 miles from the mouth of the river is the town of Villa Pilar or Nembucu, where pilots may be obtained. The houses are neatly thatched and whitewashed, each standing on a small enclosure shaded by orange trees. Off the flagstaff at the captain of the port's house, is a rock with 6 feet water on it, and

* Commander H. C. Bigge, H.M.S. *Flamingo*, 1888.

4½ fathoms close-to; it will be avoided by keeping well over on the western shore to the north point of the island, where there are depths of 3½ fathoms.

Asuncion.—From Pilar the channel is deep and winding, the scenery pretty, with occasionally large patches of cleared and cultivated land as far as Asuncion. The best anchorage at Asuncion is in 3 fathoms water, close to the shore, with the flagstaff at the captain of the port's house S.E. ½ E., distant about 2½ cables. Here a vessel will be clear of those going in and out, and the holding ground is good. Farther out the bottom is rocky, and an eddy causes vessels to swing round their anchors.

The town of Asuncion is situated on rising ground, and has a pleasing appearance. It contains several handsome buildings; the population is about 1,700, but scarcely any foreigners. The country for 20 miles round is hilly and well cultivated with coffee, maize, tobacco, sugar cane, &c. Woods of all kinds, many very durable and well adapted for ship building, are found in the forests. There is a railway to Paraguay, distant 45 miles. 264 vessels entered Asuncion in 1881, of 35,000 tons; mostly Argentine.

Communication.—A bi-monthly Paraguayen steam vessel maintains rapid communication between Buenos Aires, Rosario, Parana, Corrientes, and Asuncion; there is also a Brazilian steamer monthly to Coimbra in Matto Grosso; and others frequently running between the above intermediate ports. These steamers, of small draught, navigate the river both by day and by night, and have excellent pilots.

Directions.—Current.—The strength of the current depends upon the height of the river; above Asuncion with the water at an ordinary height it does not usually exceed 1½ miles an hour; below the embouchure of the river Vermejo the current runs from 2½ to 3 miles an hour. The navigation of the Paraguay is easier than that of the Parana, especially for steamers. There are but few shoals in the middle of the river, and as they are rocky and covered with sand, they do not shift as in the Parana. The depth is variable; it is greatest at Humaïta, where there are from 22 to 27 fathoms water, and least at the passes of Laguna, Villeta, Lambaré, &c., and where at times the depths are only about 5 or 6 feet.

Remarks on the general navigation of the Parana (page 291), apply also to the Paraguay, and most other rivers.

Large floating islands (camelottes) are brought down by the current, and often foul the cable, and may cause a vessel to drag her anchor, unless a careful look out is kept.

TABLE OF RIVER DISTANCES.

Rivers.	Places.	Miles.
URUGUAY.	Buenos Aires to Rio Negro entrance	92
	" " Mercedes (rio Negro)	127
	" " Fray Bentos (opposite the Rio Gualeguaychu)	114
	" " Concepcion del Uruguay	164
	" " Paysandu	176
	" " Concordia, and Salta	240
	" " Salto Grande	257
PARANA.	" " the mouth of the Parana Guazu	52
	" " San Pedro	135
	" " Obligado	144
	" " Saint Nicholas	170
	" " Rosario	210
	" " Santa-Fé and Parana towns	300
	" " Hernandaria point (Swiss mission)	347
	" " La Paz	383
	" " San Juan channel	393
	" " Goya	510
	" " Bella Vista	560
	" " Chimbolan pass	588
	" " Corrientes	635
	" " Salto de l'Apipe	780
	" " Salto de Guayro	1,070
PARAGUAY.	" " the mouth of the Paraguay	650
	" " Humaïta	670
	" " Villa Pilar	690
	" " Villa Franca	730
	" " Asuncion	827
	" " Villa de Concepcion	986

CHAPTER VIII.

CAPE ST. ANTONIO TO RIO NEGRO.

Variation in 1893.

Piedras point -	7° 50′ E.	Bahia Blanca -	11° 20′ E.
Cape Corrientes -	8° 50′ E.	Rio Negro -	12° 40′ E.

The COAST,* from cape San Antonio to Medano point, 40 miles to the southward, is of a light colour, low and sandy. Occasionally straggling bushes, or patches of rough grass are seen. Sand-hills between 20 and 40 feet in height begin to show themselves 10 miles to the southward of Rasa point, gradually increasing in number and height as they approach Medano point, near which they rise to about 100 feet above the sea. Two of these sand-hills near one another, in lat. 36° 27′ S., resemble a Spanish saddle; they are rather higher than their neighbours.

Between 5 and 10 miles off shore E.S.E. from Rasa point, it was found in the course of the survey that the quality of the bottom appeared different, in two different years, although the depth remained the same. This change is attributed to soft oozy mud from the Tuyu bank, being at times carried round Rasa point, and deposited upon the sandy bottom, usually found to the south-east of that point, until a strong current, or gale from seaward, washes it again into San Boronbon bay.

MEDANO BANK is an extensive and dangerous shoal, stretching 6 miles seaward from Medano point. Generally the water upon it is much discoloured, and the lead will give warning; but at any time, even in fine weather, it would be prudent to give this shoal a wide berth. In crossing it, irregular and shallow soundings were obtained;

* *See* Admiralty charts:—Sta. Catharina island to Rio de la Plata, No. 2,522; Rio de la Plato to Rio Negro, No. 1,324, scale, *m* = 0·07 of an inch; and South Atlantic ocean, western portion, No. 2,202 *b*.

and at 3 or 4 miles from the shore there are patches of not more than 2 fathoms.

About Medano point the land is higher than that on either side. A range of hills between 100 and 200 feet in height stretches to the west-north-westward.

From Medano point to the narrow isthmus, between the sea and Mar Chiquito lagoon, the coast is lower than near Medano point; but it has a similar appearance, sand-hills, from 50 to 70 feet high, with a few patches of verdure. These sand-hills, and the coast near them, have a whiter look than those to the northward of the point.

No danger is known to exist off this part of the coast; but as in some places, especially towards Medano point, the soundings are irregular, shoaling suddenly a fathom or two at a time, and then deepening again, it is as well not to go nearer than 3 miles.

LIGHT.—On Medano point stands a lighthouse 203 feet high, (tripod shaped and painted white and red in horizontal bands) from which, at an elevation of 195 feet, is exhibited a *fixed* white light, visible 21 miles.

Mar Chiquito, 60 miles S.S.W. from Medano point, is a lagoon or salt water (visible from the masthead of a passing vessel), into which flow the Tandil and other small rivers. At times it overflows and runs into the sea, but generally there is a dry bank of shingle between. Southward from the spot where the Mar Chiquito overflows, the land rises and is no longer sandy. A low range of cliffs, from 20 to 30 feet in height, is surmounted by a rising ground, of which the highest is about 80 feet above the sea. Pasture land now meets the eye. On that high ground near which is the Estancia de la Loberia chica (Small Seal farm), large numbers of fine cattle may be seen feeding.

CAPE CORRIENTES, 18 miles southward of Mar Chiquito, is a rather bold headland about 120 feet high; it is the south-eastern extremity of a range of hills trending east and west. The Sierra Tandil and Sierra Vulcan form part of this range. In clear weather three ranges of the latter are visible, having a wedge-like form, somewhat resembling the Bill of Portland. Near the sea these hill, slope away gradually, and are ended by a broken rocky shore.

Laguna de Los Padres.—Half a mile northward of the cape is a bay, with the town and church of Laguna de los Padres to the westward. Wool is shipped from this place, brought out through the

surf in flat-bottom boats, and thence transhipped to cutters and taken to the vessels in the road.

Anchorage.—There is good holding ground in 6 fathoms clay, with the church bearing about W. by S., and cape Corrientes S.S.E. The anchors should be lifted occasionally as they are liable to get buried. The anchorage is an exposed one, with constant rolling and pitching, and vessels are recommended to proceed to sea with on-shore winds, as many wrecks have taken place through vessels parting their cables. Landing in ships boats is difficut. Provision are dear with the exception of meat. A vessel may anchor in this bay during off-shore winds in 5 to 10 fathoms water, over clean sandy bottom; but with easterly winds of any strength a heavy swell would set in, and render the anchorage unsafe.

MOGOTES POINT, 5 miles southward of cape Corrientes, is 104 feet high, bare, and sandy; terminating towards the sea in a low projecting spit, to which a vessel should give a berth of 2 miles. When near the point, several sand-hills may be distinguished, some of which are peaked and higher than others, whence the name Mogotes signifying pointed cornstacks, which these sand-hills rather resemble. Behind the sand-hills the high downs already described, extend to the westward.

LIGHT.—On Mogotes point stands a lighthouse 115 feet high, from which at an elevation of 180 feet above high water, is exhibited a *revolving* white light *every minute*, visible *thirty-two seconds* and eclipsed *twenty-eight seconds;* the light should be seen in clear weather from a distance of 20 miles.

ANDRES HEAD, in lat. 38° 18′ S., long 57° 38′ W., is the south-west extremity of a range of bold cliffs about 70 feet high, which extend half way between that head and Mogotes point. Where they terminate the shore is low, sandy, and rocky. The bight between Mogotes point and Andres head is foul and dangerous; many sunken rocks lie near the shore, causing blind breakers at sudden intervals. A short distance from Andres head is the Estancia de la Sociedad (Society farm).

Tides and Currents.—It is high water, full and change, off Andres head at 10h., rise 8 feet. The flood sets to the northward and and the ebb to the southward. The currents between Andres head and cape San Antonio set strongly to the northward previous to and

during southerly winds; and as strongly in the opposite direction under contrary circumstances. From one to 3 miles are usually the limits of strength, although there are intervals when no current is perceptible; and times, although rare, when its strength may exceed that above mentioned.

The COAST from Andres head to Hermeneg point, 12 miles to the south-west, is rugged, and from 20 to 30 feet in height. There are a few detached irregular cliffs, and some gaps, or creeks, which might afford a landing-place for a boat in fine weather; but there is neither shelter nor anchorage for a vessel. Close to Hermeneg point is a bight, into which runs a small stream of fresh water.

Very few bushes appear on this part of shore, and scarcely a tree, excepting a few near the Estancia de la Sociedad. Sometimes a considerable extent of grass land is seen, but in most places near the sea the ground appears sandy and barren, thinly covered here and there with coarse grass, or by low prickly shrubs.

From Hermeneg point to Black point, and thence onwards to Asuncion point and mount Hermoso, a distance of 10 miles to the westward, the coast has a similar appearance, and is equally unfit to approach. Occasionally the sand-hills rise to 100 or 130 feet above the sea, some are more than usually barren, or there are a few more bushes, and rather more grass, to vary the view; but there is no other variety in this tiresome coast. The river Gueguen, or Josef, runs into the sea about 5 miles eastward of Black point. Its entrance is accessible to boats during moderate weather, when there is not much swell. A heavy swell is generally rolling towards the exposed shore.

Caution is necessary in weighing, should necessity compel a vessel to anchor off this coast. Although fine sand and broken shells are brought up by the lead, the ground which is hard tosca, is full of holes, and unless great care is taken a vessel is liable to part the chain or break the anchor.*

EL RINCON, or the Corner, is the deep bight formed by the sudden change in the direction of the coast on each side of Bahia Blanca. Generally speaking it is shallow.

In El Rincon, and along the coasts to the eastward and southward, the lead will invariably bring up sand, or sand mixed with broken

* H.M.S. *Beagle* lost three anchors in one week whilst engaged in surveying the coast.

shells, and perhaps some gravel; but the quality and colour of the sand is very different in different situations, and should be carefully noticed, whether with a view to anchoring in good ground, or avoiding any of the numerous and very dangerous sand-banks along the coasts between Bahia Blanca and the Rio Negro. On and near the banks the sand is always of a dark brown colour, very fine, and generally unmixed with other substances; sometimes pieces of shell come up on the lead; seldom anything else. If an anchor be let go upon this sort of ground, its recovery is doubtful. There may be soft ground underneath, but rarely; most of the banks are formed of tosca (hard clay), and this very fine dark brown sand is simply the tosca pulverized. In the offing, over soft ground, the sand is speckled, or black or white, rather fine generally; when coarse it is mixed with gravel: broken shells are frequent, though they do not occur so regularly as to assist in ascertaining a vessel's position.

Having such soundings as those last described, the seaman may be certain that his vessel is out of danger from a shoal; and that if necessary an anchor may be dropped with confidence. At night, if the weather be moderately fine and the wind off-shore, it is better to anchor than to keep under sail. South or east winds send a swell into El Rincon, which obliges vessels to keep under sail; but north and west winds prevail during at least four days out of five.

Asuncion point, 95 miles westward of the river Gueguen, is the termination of a projecting sand-hill 120 feet above the sea, difficult to distinguish with certainty, yet the most marked feature of this unvaried coast.

Shoal.—At the distance of 17 miles S.W. of Asuncion point, and at 6 miles from the shore, there is a shoal with only 13 feet water.

In this vicinity, the shore should not be approached within 8 miles.

Sierra Ventana is a mountain 3,500 feet above the sea; an extraordinary height in this low country. It derives its name from a hole in it, near the top, resembling a window. It is situated about 75 miles N.W. by W. ¾ W. from Asuncion point, and the Gauchos call it monte Hurtado, implying that it is out of place.

When seen from the south-east, the summit is peaked; from the south, it appears rather square, with a notch in the middle.* A good

* *See* view of Sierra Ventana, on Admiralty chart, No. 1,324.

bearing of this mountain and the latitude of the vessel will fix her position with certainty. In very clear weather the peaks may be visible from the distance of 65 miles.

Tides.—It is high water, full and change, in El Rincon about 5h. The tidal streams set strongly, the flood to the north, the ebb to the south, nearly 6 hours each way; off Asuncion point the flood sets to the eastward. They are much influenced by the winds, their strength varying from one to 4 knots when within 10 miles of the banks or land; and from half a knot to 2 knots when between 10 and 20 miles from the outer limit of the dangers.

Directions.—Sailing vessels when bound for El Rincon, if the weather threaten, or the wind be southerly or easterly, should stand off-shore during the greater part of the night. Heaving to, or making free with the land, is not to be recommended on any coast, much less on this, which is considered by those who have frequented it during many years to be most intricate and dangerous.

The land is extremely low, almost flat, in most places. The banks are extensive, and suddenly steep. A vessel may shoal the water from 10 to 2 fathoms in the distance of a quarter of a mile, even while out of sight of land from the deck. To these inconveniences should also be added strong tides, and gales from the south-east, which bring thick weather and a heavy sea, overfalling and breaking as it approaches the banks.

When steering towards El Rincon, if the object be to anchor in or near Bahia Blanca, the northern shore between Black point and Asuncion point should be kept in sight from aloft; or the ship should be kept between the parallels of 39° 5′ and 39° 15′. Eastward of Asuncion point, the land may be approached as near as may be thought proper.

Westward of Asuncion point, and thence along shore, the soundings are irregular, within 8 miles of the land, and more caution must be used. Ridges of tosca extend out in a south-east direction 5 to 10 miles from the shore. These ridges are so frequent and so regular, that crossing them from north east to south-west gives one the idea of a vast ground swell, the hollows of which are occasionally 6 fathoms lower than the risings, and about 2 cables from one hollow to another; the depths shoal suddenly from 8 to 6, and at times from 10 to 4 fathoms; and the water deepens again as quickly as it shoals.

The shoal of 2¼ fathoms, 6 miles from the land, and 17 miles S.W. of Asuncion point, must be avoided; it is absolutely necessary, therefore, to keep fully 8 miles from the land.

When 30 miles to the westward of Asuncion point, and about the parallel of 39° 10′, the Sierra Ventana may be seen if the weather be very clear, bearing about N.W., distant 65 miles. If not seen, the distance of the vessel from the north shore should first be ascertained: either by latitude, or by steering North, with attention to the lead and the look-out, until the water shoals to 8 or 7 fathoms, if the land be not seen previously to obtaining that depth. Thence a course may be steered to make the yellow buoy moored off Bahia Blanca 13½ miles S. by E. ½ E. from mount Hermoso, or for the anchorage eastward of that mount.

PORT BELGRANO* (Bahia Blanca), formed in the bight of El Rincon, is the first port southward of the Rio de la Plata. It extends 38 miles inland and terminates in a creek. Surveyed by Captain R. Fitzroy, of H.M.S. *Beagle*, in the year 1833, this port has been visited by few vessels, but has recently derived considerable commercial importance. The channel from No. 1 buoy to punta Pipa, was re-sounded by H.M.S. *Sylvia*, 1883.

H.M.S. *Amethyst*, drawing 19 feet, and H.M.S. *Rambler*, drawing 13½ feet, have entered port Belgrano. The *Rambler* proceeded to the inner port of Bahia Blanca.

Mount Hermoso, situated on the north side of the entrance to port Belgrano, is a round hill 120 feet in height, with a spar on its summit, on which is exhibited the light. It is close to the sea at the north side of entrance to port Belgrano, and is conspicuous when seen from the eastward; from the southward, this little mount is confounded with the adjacent land, and by a stranger would hardly be made out; westward of it the land is lower, and is not at first visible. Below the mount a low cliff of about 12 feet in height will be seen; it is the only one hereabouts, and is named Parrot cliff.†

Telegraph.—A signal station is established at mount Hermoso, which enables vessels to communicate with the town and the pilots;

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* *See* Admiralty plan:—Port Belgrano, No. 1,331, scale, $m = 0{\cdot}9$ of an inch.

† *See* Admiralty chart:—Bahia Blanca to Union bay, No. 1,329, scale, $m = 0{\cdot}31$ of an inch.

here also is a station for the relief of shipwrecked crews, where temporary shelter and food will be supplied.

Hermoso road with a depth of 6 fathoms lies about 4 miles S.S.E. of the mount.

LIGHT.—A fixed white light is exhibited from a mast on mount Hermoso, and is reported to be visible from 7 to 15 miles.

The northern shore, from mount Hermoso westward, is low, being a succession of sand-hills, partly covered with shrubs and rough grass. Anchorstock hill, 15 miles westward of the mount, is the highest (57 feet) and most peaked of the hummocks seen to the north-westward; about 2½ miles eastward of Anchorstock hill is a tripod beacon, a useful mark when entering the port. Westward of Anchorstock hill the coast trends westward to Ciguena point, off which there is anchorage, and to punta Alta, a distance of 5 miles; thence in a W.N.W. direction for about 10 miles to the inner port of Bahia Blanca.

The south shore of port Belgrano is formed by Zuraita island, a low, flat, marshy island intersected by creeks. The tops of some of the bushes may be seen from the masthead, when approaching from seaward, but the island will not be seen.

Pilots.—The services of a pilot off the entrance of the port cannot be depended on. Pilots reside at punta Pipa.

Should the signal for a pilot not be attended to, vessels should endeavour to reach the anchorage abreast No. 8 buoy, off Punta Ciguena, from which position they can be seen from the town.

Wrecks.—Two wrecks lie respectively 9 cables S.E. of Anchorstock hill, and 7 cables S. ¾ E. of the tripod. The latter shows conspicuously from eastward or westward, appearing as a rock detached from the land.

Dangers at entrance.—The banks at the entrance have undergone some alteration since Captain Fitzroy's survey. From Punta Alta to Napostá river, a distance of 9 miles, the channel has undergone considerable change, and vessels drawing more than 10 feet, are recommended to take a pilot.

The dangers to be guarded against in entering port Belgrano are two extensive shoals; namely, the Toro on the south-west and North

bank on the north-east, which nearly block up the entrance. The narrowest part of the channel about half a mile wide, is between what is called the East and West Gate posts.

The banks are all hard; of fine dark brown sand where they are steep and dangerous; of coarser and lighter coloured sand, where flat and safer to approach. The Toro and the eastern extremity of the North bank are instances of the different qualities.

The fine dark brown sand generally lies upon tosco. In the channels, between the banks, the bottom is everywhere dark, soft, sandy mud. On and near the banks it is everywhere hard. In the offing, when in the fair way, the ground will feel rather soft and sticky; still farther off it is somewhat hard, being clay covered by speckled sand, with broken shells.

The Great North Bank, projecting south-eastward about 10 miles from the north shore, shoals very gradually. The Toro bank and Horn spits are the reverse; from the deepest water between these banks, it shoals so suddenly that there is hardly time for the best leadsman to give warning.

Breakers are sometimes found on the edges of these banks; at others, only ripplings. Sometimes there is not a mark on the water by which they can be distinguished by a stranger. In fine weather the water is smoother on the banks than it is in the channels, where there is a slight tide ripple. This is also the case with a fresh breeze at high water; but at low water, particularly with a breeze, breakers show themselves upon the banks in all directions. With or after south-east winds, as long as the swell lasts, there are breakers on all the banks.

Buoyage.—The Gateway or main channel leading to port Belgrano has a depth of 4¼ fathoms at low water, and has been buoyed by the Argentine Government.

There are seven buoys placed in the channel leading to port Belgrano. The first buoy, entering from seaward, is in lat. 39° 12′ S., long. 61° 39′ W., and bears S. by E. ½ E. 13½ miles from Mount Hermoso; it is moored in 5¼ fathoms, painted yellow, and marked No. 1 in black figures. The buoy is conical, about 11 feet out of water, and is visible in clear weather from a vessel's deck at a distance of 5 or 6 miles.

The other buoys are painted red, and numbered from 2 to 7 in white figures.

Nos. 3, 4, 5, and 6 buoys should be in line with each other and with the tripod, bearing N. 52° W. This is a good guide to ascertain if these buoys are in position. No. 7 buoy is a little to the eastward of this line. Half a mile north-eastward of No. 6 the channel is at its narrowest, and care must be taken to make a N.W. course from that buoy.

Directions.—The best time for entering is near low water, as the channels between the mud-banks can then be seen; and guided by the buoys no great difficulty is experienced, but it should be observed that a heavy sea prevails with S.E. winds. If the weather be thick, it will be prudent to anchor or stand off.

In clear weather, if the vessel's position shall have been correctly ascertained, she may steer for the yellow buoy; otherwise endeavour first to sight mount Hermoso. This is not easy to make out, but will appear as the left extreme of the land when seen from the south-eastward. No land will be seen to the westward; but from the masthead, the tops of some bushes on Zuraita island, on the west side of entrance, may be seen.

Avoiding the eastern edge of North bank, pass the yellow buoy close-to on the port hand, and steering N.W. by W ½ W., allowing for drift, will lead to No. 2 buoy; thence N.W. ¾ W. from buoy to buoy on the port hand in not less than 4¼ fathoms water.

After passing No. 4 buoy, the wreck of a vessel (formerly intended for a light vessel, but which broke from her moorings) will be seen on the East Gate-post, and as her two lower masts are still standing, she forms a useful mark. The wreck in line with mount Hermoso, bears N.E. ¼ E.

Pass about 30 yards north-eastward of No. 5 buoy, and westward of the wreck, and having arrived at No. 6 buoy, a tripod will be seen on a sandhill to the westward of Nameless point. A bearing of the tripod will assist, if No. 7 buoy be not seen; but it should be seen if in position.

Arrived off No. 7 buoy, the vessel will be clear of the narrow channel, and will have entered port Belgrano; a W. by N. course should then be steered up the harbour, passing half a mile north of No. 8 buoy (distant 9 miles from No. 7) and about three-quarters of a mile off the north shore, is not less than 7 fathoms.

Caution.—The entrance to the port should not be attempted until the buoys are seen.

Anchorage.—The *Amethyst* found good anchorage in 12 fathoms, sand and mud, about one mile below point Cigueña, and one mile from the north shore of the port. In this berth the tides ran from one to 4 knots an hour. It is recommended to moor with a good scope of cable.

Channel to Inner Port.—No. 9 buoys bears W. by N. ¾ N. from No. 8, which is a little over a mile south of Cigueña point. The line joining these buoys leads over the northern edge of the banks on the south side of the channel, extending about 1½ miles eastward of No. 9, in 3 fathoms. From a position about half a mile northward of No. 8 buoy, a course W. by N. ½ N. should be steered, passing just northward of No. 9 buoy, which is close to the edge of the shoal. This part of the channel and onwards requires caution, and a vessel should not attempt it on a falling tide. From No. 9 buoy steer W. by N. ¼ N. with the pole on punta Pipa on the port bow, until a clump of trees near the Napostá river is seen between the East and West Entrance posts, about one-third of the way from the former to the latter; when the trees must be steered for on a N.N.W. ½ W. course, passing between the above two posts which mark the entrance of the narrow channel to the inner port of Bahia Blanca.

Directions.—These posts are about 30 feet high and supported by wire stays; the east post has a small triangle on it. Thence, the east side of the channel is marked by posts which if passed at about 80 yards distant, will lead in 14 feet at low water until abreast of Napostá river, where, extending across the inlet, there is a bar with only 7 feet at low water on its deepest part. At high water there are depths of 17 to 20 feet on the bar, and vessels drawing 19 feet have passed over the bar.*

Having crossed the bar, keep in mid-stream, steering W. by N. ½ N., and moor in about 4 fathoms at low water, at a convenient distance from the railway pier.

Bahia Blanca is the name of the town situated about 5 miles to the north-north-west of the entrance of Napostá river; the town has a population (1892) of 5000, and is increasing in importance. The Great Southern railway and telegraph connects Bahia Blanca with Buenos Aires; the terminus, named Puerto Nuevo, being at a pier one mile W. by N. from the low water entrance of the Naposta pier.

* The channel from No. 1 buoy to punta Pipa was partially re-sounded by H.M.S. *Sylvia*, 1883.

There is a depth of 26 to 28 feet at low water alongside the outer part of this pier; other wharves for loading alongside, are in progress.

Anchorage.—For half a mile on either side of the pier, good anchorage with smooth water will be found. The best holding ground is S.E. of the extremity of the pier in 21 feet, mud. The holding ground near the landing place is bad.

Supplies.—Fresh beef and other provisions can be obtained; also fish by the seine. Deer, ostriches, partridges, and a bird like a small crested guinea fowl, are to be found in the neighbourhood. Water may be obtained from the wells under Anchorstock hill, and at the inner port.

Coal.—There is no coal depôt; the railway company have coal, but cannot sell it without the permission of the Government. There are no lighters; a vessel would have to coal alongside the pier.

Water.—Water is laid on to the pier, and may be obtained from the railway company.

Winds.—The prevailing wind is N.W., which blows very strong, but this wind is local and seldom extends far to seaward. When the N.W. wind has blown for some days it shifts to S.W. and S.E., which winds sometimes blow with great strength. Thick fogs and heavy dew are experienced with N. and N.E. winds.

Tides.—It is high water, full and change, at Port Belgrano at 6h.; springs rise 16 feet; neaps 13 feet. The rise of tide, however, is much influenced by the wind; N.W. winds lowering the level, S.E. winds raising it. In the entrance the tide runs between and parallel to the banks, nearly north-west and south-east, from one to 3 knots.

FALSA BAY, the next inlet to southward of port Belgrano, is an extensive and dreary waste. Sand-banks surround it, and neither land nor land-marks can be seen until a vessel is within its banks. What it might become in the hands of an enterprising and seafaring people would be something widely different from its present state; but now, without even a point of land in sight, the lead, the chart, and the latitude alone assist the seaman. The remarks on the precaution necessary and on the nature of the banks, just given in the description of port Belgrano, apply equally to Falsa bay, to

Green bay, and to Brightman inlet.* As little is known of these places, they should not be attempted without local knowledge.

Between port Belgrano and Falsa bay are Horn spit, lower Toro bank, and Lobos bank. The latter does not shoal so quickly as the others; but it stretches out to the south-east at least as far as lat. 39° 21′ S. These banks should be carefully avoided. A large part of the Lobos uncovers at half-ebb.

Labyrinth shoals.—South and west of Falsa bay the Labyrinth shoals, nearly all under water, extend to the south-east, from Ariadne island to the parallel of 39° 27′. Here and there a patch of sand is uncovered temporarily, and affords a resting place for seals. When near these shoals some rising ground will be seen on Green island, appearing rather high, because surounded by a dead flat, although only 60 feet above water.

Paz bank, the south-east extremity of the labyrinth shoals, is the most outlying and very dangerous. There is about 4 feet water on it; and its seaward side shoals gradually. As the land is in sight from the vicinity of this bank, it is not difficult to avoid it during daylight; the heights upon Green island bear from it about W.N.W., 8 miles, the nearest point of the island is distant 5 miles.

GREEN BAY, formed to the south-west of Paz bank, is beset with shoals in its western part, though the entrance appears somewhat tempting. If it be absolutely necessary to enter, keep close to Green island bank, feeling its edge by the lead, and anchor to the northward of the narrow passage off the east end of Green island, with the peaked hillocks bearing about W. by S. ½ S. Remember that the banks on the east side of entrance shoal suddenly, and that low water should be chosen as the time to enter.

BRIGHTMAN INLET is formed between Green island and Labyrinth head. A spit extends in a southerly direction from Green island to lat. 39° 29′ S., and between the spit and the western shore is this narrow bar harbour, which at a distance looks like a large river. On the south side of entrance the land is level and rather low, terminating in Labyrinth bluff, 40 feet in height. On Green island are some peaked hillocks, rising 60 feet above the sea; and at the southern extremity of the island is a single hillock, of use as

* As the survey of this portion, which is probably subject to constant alteration, was made in 1883, little reliance can be placed in the chart or the directions.

a mark. At low water there was 2 fathoms on the bar, which is about 2 cables wide.

It appears probable that a creek fordable at low water, is the only separation between Green island and the main.

Green island has an excellent soil, and with its good anchorage and deep water close to the shore, is capable of much improvement. At the north-east point, between the hillocks and Green bay, there is an eligible spot for a settlement.

Supplies.—There is abundance of game on the main and on Green island. Good water may be obtained by digging wells, about 8 feet deep, on the island. Plenty of fuel may be cut on the main land.

Tides.—It is high water, full and change, in Brightman inlet at about 5h.; springs rise 12 feet, neaps 8 feet. The flood-tide sets across the entrance, therefore a vessel should keep to the southward sufficiently to ensure a proper position. There is only half an hour's interval between high water in the inlet and in the offing. The strength of the tide stream is between one and 2 knots.

Directions.—A vessel approaching Brightman inlet, with a view of anchoring, should not go to the northward of lat. 39° 30′ S. Farther south will be still safer, because the coast between the inlet and the Rio Colorado is quite free from outlying dangers, while to the northward of that parallel the banks are extensive and dangerous. To pass over the bar, bring Labyrinth head to bear N.W. ½ W., and when the east end of Green island bears N. by W. ½ W. the vessel will be close to or upon it. Keep Labyrinth head on the above bearing until the water deepens to 3½ or 4 fathoms, with the single hillock on the southern extremity of Green island bearing N.N.W. Steer upon that line, keeping the above single hillock on the same bearing, until Labyrinth head bears W.S.W.; then steer W. by N. ½ N., until almost in a line between the single hillock and Labyrinth head, when a vessel may anchor in about 4 fathoms water over soft muddy bottom.*

The COAST from Labyrinth head trends in a southerly direction, to the mouth of the Rio Colorado, a distance of 25 miles, and is quite free from dangers of any description. The water shoals regularly, and a vessel may close the low land as convenient by the lead. A

* *See* footnote on page 308.

range of sand-hills, between 30 and 40 feet in height, extends parallel to the shore. The beach is sandy, and in some parts dries off more than a mile at low water.

At the entrance of the Colorado the sand-hills end abruptly, forming a low but distinct headland. Flat-top hill is a sand-hill covered with verdure, rising to the height of 40 feet, at three-quarters of a mile north of the river. It is the highest about that part of the coast, and may easily be recognised by a stranger.

RIO COLORADO rises at the foot of the eastern slope of the Andes, and after a course of above 550 miles in a general south-east direction falls into the sea, at 7 miles north of Union bay. The river is accessible to coasters of 7 feet draught. The bar, about one mile off the entrance, and the banks inside the river, are continually changing their position.

The entrance to the river may be known by the abrupt ending of the sand-hills. South of the river the land is flat and low. When east of the river's mouth, trees (a kind of willow, and the only trees on the coast) will be seen growing on the banks, a short distance in-shore. The entrance to the river is not more than half a cable in breadth, and has only 3 feet at low water. It is difficult to enter, even with the flood tide, unless the wind is fair, and not too strong. The stream of the river makes the flood tide weak; the ebb runs very strong. A strong south-east or easterly wind throws so much sea upon the bar that it is then useless to make the attempt.

Caution.—No vessel, however small, should attempt to enter while there is a swell on the bar. It is also prudent to wait during one low water at the entrance, in order to see which is the best channel. It is the only safe way. Sometimes the water is fresh outside the bar.

UNION BAY, 7 miles southward of the Colorado, is adapted to the use of vessels drawing less than 17 feet. In smooth water, with a fair wind, a deeper draught vessel might enter, as there is not less than 5 fathoms in the fairway at high water.

Indian head, the north point of the bay, appears as an island when seen from the northward, the land westward of it being very low. It is 25 feet high, bluff to the south-east, composed of sand hillocks partly covered with bushes, and cannot be mistaken; as it rises from very low land, which nowhere exceeds 20 feet in height, and is in many places almost level with the water at ordinary spring tides.

Creek hills are three hillocks about 70 feet high, and situated 2 miles north-west of Indian head. A little to the westward of Indian head is a creek, which passes close to Creek hills, and through which boats may work their way to Colorado at half-tide. Firewood is scarce about Indian head, but good water may be obtained by digging a few feet into the sand.

Union bay will be of great advantage when the banks of the Colorado are inhabited and cultivated. All intercourse with that river, and by that river with the interior, must be carried on through this bay, which has so good a port, entirely sheltered, landing-places so practicable, and the whole so accessible if lighted and buoyed.

Banks.—The chief dangers to be guarded against in approaching and entering the bay are, the Serpent bank, the Dog bank, and the tide which sets across them. The Serpent bank extends in a long ridge 4 or 5 miles in an easterly direction from Indian head. As far out as 2 miles from the land it dries at low water. It shoals gradually on the north, but rather suddenly on the south or channel side. The Dog bank extends in a similar manner to the eastward from the south point of the bay, but is of greater extent. The water shoals upon its edge rather quickly.

The quality of the bottom alters as the vessel approaches these banks, as it does in the other inlets and harbours of this coast. In the middle of the channels there is soft, dark-coloured sandy mud; near and upon the banks there is hard, fine, brown sand.

Tides.—It is high water, full and change, in Union bay at 3h. 10m.; springs rise 12 feet, neaps 9 feet. The flood-tide at the entrance sets to the northward across the banks about 2 miles an hour. The ebb-tide, from 2½ to 3 miles an hour, sets right out at first, and then more to the southward as it clears Dog bank.

Directions.*—Vessels intending to enter Union bay should make the land about the river Colorado, where the coast is clear and the lead may be trusted. Look out for Flat-top hill, 40 feet high, just north of the Colorado, and when it bears W. by N., and is distant 5 miles, the depth will be 5 to 7 fathoms, sand. From thence steer S. by E. ½ E., or rather make good that course until the water shoals upon the north side of the Serpent bank, or until Creek hill bears W. by S. Starve island, and perhaps a part of the south-west side of

* *See* footnote on page 308.

Union bay, may be seen at the same time as, or soon after, Indian head.

On Starve island there is a peaked hillock (the middle one of three), which may be of use when crossing the tail of the Serpent. It must be kept to the westward of S.W. by W. while crossing, in order to insure having sufficient water. When Creek hill bears W. by S. and Indian head S.W. by W. ½ W., steer S.E. 5 miles (by ground log), then S.S.W., until Indian head bears W. by N. ½ N., when steer for it on that bearing (allowing for tide) until the vessel is between the Serpent and Dog banks, and between 2 and 3 miles from the head; then steer W. ½ S., and anchor with Indian head N.N.W. distant half a mile, in 4 fathoms at low water, over soft muddy bottom.

This anchorage is preferable, because of ready communication with the shore. Mud flats extend so far from the land in all other parts, that at low water a boat cannot land.

ANEGADA BAY.*—That portion of coast lying to the southward of Union bay, between Indian and Rubia heads, a distance of 38 miles, is appropriately named Anegada (lowland overflow) bay. Through it there are numerous creek communications, by which a boat may proceed to Union bay, and thence to the Colorado.

Sand-banks.—Extensive sand-banks stretch from 10 to 15 miles seaward, off the whole of this coast, some of which appear soon after first quarter ebb. At high water very little dry land can be distinguished, from the outer edge of these shoals, even from the masthead. Every vessel, therefore, should give these shoals a wide berth, more particularly when bound northward, as the flood tide sets north-westward towards the banks from one to 3 miles an hour. These shoals are in ridges parallel to the coast, with depths of 2 to 6 fathoms on them, and from 8 to 12 fathoms between.

There are always breakers near the edges of the bank; but on the dangerous ridges, where the depths are only 2 or 3 fathoms, there are no breakers in fine weather. A slight rippling, or an unusual smoothness, and some difference in the colour of the water, are, with the soundings, the only warnings of these dangers. When there is much swell the whole extent of the banks is shown, even where there are 4 or 5 fathoms water over them.

* *See* Admiralty chart:—Union bay to Rio Negro, No. 1,358, scale, $m = 0{\cdot}31$ of an inch.

Viper bank and the tail of the Snake, with their accompaniment of parallel ridges, are extremely dangerous. In proceeding to the southward there is less danger if the lead be carefully attended, because, the water shoaling upon the outside bank first, the vessel may at once haul off to seaward.

Strong southerly winds raise the flood tide, causing it to run from a half to one hour longer, and with more strength. Strong northerly winds have a diminishing effect upon the flood, but they make the ebb run stronger, and cause the water to fall unusually.

While passing these banks, Creek and Deer islands may be seen from the mast-head if the weather be clear, but it is better to keep so far off as not to see land at all.

North-east sands extend 10 miles eastward from the shore of Deer island; but the depth is only 3 fathoms at 13 miles E. ¾ S. from the north point of the island. The southern portion of North-east sands terminates in Sand Blas harbour, and is the northern side of the channel.

SAN BLAS HARBOUR* is formed to the southward of the low islands and extensive sand-banks of Anegada bay. Although opening into an extensive and well sheltered harbour, the entrance to San Blas is considerably obstructed by banks, which cause strong tides in the narrow channels between North-east sands and Rubia, head, its southern point of entrance.

San Blas banks.—These banks, named the Hellgat, Middle, East, and North-east banks, extend for a distance of 6 miles southward of the entrance to San Blas harbour, with three navigable channels. The centre one, named Constitucion channel, 4 cables wide, with a depth of about 19 feet at low water springs (in 1888), or less water than is charted; it is buoyed, and with proper precautions it is said to be not difficult of access.

Settlement.—The settlement is about 3½ miles within Rubia head, on the south shore, and off which there is secure anchorage. There is frequent communications with San Carmen, on the Rio Negro, about 40 miles to the south-westward direct.

* *See* Admiralty plan :—San Blas harbour, on chart No. 1,358, scale, $m = 0{\cdot}31$ of an inch.

Climate.—There is no rainy season, but during winter there are occasional though not heavy rains. During most summer nights there is no dew.

Beacons and buoys.—A square tower 22 feet in height and painted in black and white horizontal bands, stands on the sand hill over Rubia point, 6 miles southward of Rubia head; its summit is 70 feet above high water, and visible from a distance of 12 miles A post has been erected near the shore, at 3 miles northward of Rubia point tower, to assist small craft when entering by the West passage.

Four large conical buoys, said to be visible about 5 miles under favourable circumstances, have been placed on the west side of Constitucion channel, in a general N.W. by N. direction, and about 1½ miles apart; but neither the colour nor position of the buoys can be depended on.

No. 1, or bar buoy, lies in 5 fathoms, about one cable from the south-east extreme of Middle bank, with Rubia point tower bearing S. 66° W., distant 5½ miles, and Rubia head N. 38° W. No. 2 buoy, in 6 fathoms, lies N. 21° W., distant $1\frac{6}{10}$ miles from No. 1 buoy, and marks the east side of Middle bank. No. 3 buoy lies in 4½ fathoms, N. 55° W., distant $1\frac{3}{10}$ miles from No. 2 buoy. No. 4 buoy, in 6½ fathoms, marks the east side of Hellgat bank, N. 25° W., distant $1\frac{9}{10}$ miles from No. 3 buoy, with Rubia head bearing S. 80° W., distant about 9 cables. On account of the strong tides and other circumstances too much dependence must not be placed on the buoys maintaining these positions.

Directions.—Constitucion channel.—On account of the strong tides which prevail off San Blas, and the dangerous set of the flood on to the banks at the entrance and to the north-eastward, sailing vessels, with flood tide, should make the land about Raza point, well to the southward; with the ebb or southerly set, the land might be made about Second Barranca or Rubia points; the tower on the latter is a good landmark. The best time for vessels to cross the bar is at the last of the ebb, when the banks, though not dry, are rendered plainly visible by the sea breaking over them, and are said to afford a sufficient guide at that state of the tide, even in the absence of the buoys.

A vessel will thus also have the first of the flood to carry her to the anchorage. With Rubia tower bearing West, distant 6 miles, a

course N.N.W. for 2½ miles should take a vessel to the outer bar buoy, marking the west side of entrance to Constitucion channel; pass about 2 cables eastward of the buoy, in about 19 feet at low water, the least depth on the bar (in 1888); the same course will carry a vessel to No. 2 buoy; thence to No. 3 buoy the course is N.W., or for Rubia head; and from No. 3 to 4 buoy, N.N.W. until Rubia head bears about S.W., when the vessel will be in Broad channel, and should keep near the south shore, which is steep-to, as far as the anchorage.

When working through Constitucion channel, vessels may stand over towards East bank by the lead, as the shoaling of the water is gradual, but Middle bank is steep-to and gives no warning. Also, when working up Broad channel, within Rubia head, do not stand far over to the north shore, as the water shoals suddenly to 3 fathoms and less.

The flood tide sets strongly towards East bank, and the ebb towards and over Hellgat and the northern part of Middle bank, and in the southern part of Constitucion channel towards East bank. Its velocity is from 2 to 4 knots, the flood being somewhat stronger than the ebb. South-east gales will increase the velocity at times to 5 knots, and have been known to augment the rise of tide by several feet.

West Passage lies between Hellgat bank and the shore, to which Hellgat bank is connected at both extremes. Being near the shore and protected by the extensive banks to the eastward, this channel is much smoother than the Constitucion, and is recommended for boats; it may be taken by steam or sailing-vessels of 10 feet draught, but it is not recommended for sailing-vessels except with a fair and steady breeze.

Its outer and southern bar, at one mile northward of Rubia tower, has a depth of 11 or 12 feet at low water; its northern bar, just northward of Rubia head, has but 5 feet, but it may be avoided by crossing Hellgat bank, about mid-way between these bars. The tides run fair through West passage, at a rate of 3 knots. To enter, steer for the post beacon at 3 miles northward of Rubia tower, bearing N.W. ½ N., until Rubia tower bears S.W., where the depth should be 4 fathoms; then alter course to N. ¼ E., crossing the south bar in about 12 feet at low water; when the tower bears S.S.W. ¾ W. it should be brought astern, and kept on that bearing, which apparently leads across the Hellgat in 15 feet least water;

when the water deepens to 4 fathoms the vessel will be in Constitucion channel, and should then steer for No. 4 buoy.

East channel, being so far from the shore, and also near the dangerous North-east banks, is not recommended; but it appears to have as much water as Constitucion channel. It is not buoyed.

Anchorage.—The best anchorage is in 14 fathoms, off the watering-place, 4 miles within Rubia head, at half a mile from the beach, secure from all winds, and well sheltered from the south-east. Moor, with open hawse to the south.

The beach is steep-to, having 6 fathoms a few yards from it. The bottom is stiff sandy mud, covered with coarse gravel and shingle. Boats may land here in any weather.

Supplies.—There is a plentiful supply of good water in the wells near the beach in San Blas harbour. From one of these wells, formed by sinking two casks in the ground, one placed above the other, a vessel obtained 5 tons of water in one day.

Fuel is scarce in the immediate neighbourhood, but can be procured in quantity, and of good quality, by sending to the inhabitants, who bring it from the interior in carts. It is called Peccolini, is the best fuel on this coast, and perhaps as good as any wood for burning. Iron may be brought by it to a welding heat. Fresh provisions may be procured in abundance. Fish are plentiful.

Tides.—It is high water, full and change, at Rubia head at 1h. 30m., in the harbour at 2h.; springs rise 12 feet, neaps 10 feet; but it is affected here, as elsewhere on the coast, by the wind.

The tides run along this coast with dangerous strength, from 2 to 4 miles an hour. The flood is the strongest by nearly a mile, and as it sets directly towards the outlying banks, a vessel must, when near the entrance, with the flood tide running, if not going to enter the harbour, stand to the southward, or anchor, and wait for the ebb. With the flood tide, weighing would be out of the question.

With, and after a gale from the south-eastward, both channels and banks are covered with heavy rollers and breakers. At such a time it would be highly improper attempting to enter. The last part of the flood tide comes from the northward, from Anegada bay, at which time the tide is beginning to ebb at the Gats.

The COAST between Rubia head and Rubia point, and southward to the Rio Negro, is a line of sand-hills, few as high as Rubia point, here and there partly covered by rough grass, and by low prickly shrubs. From Rubia point to the bar of the Negro, the coast may be more closely approached, for there are neither shoals nor rocks when one mile from the beach, and the lead may be trusted ; but the tides set strongly from 2 to 4 miles an hour, following the coast nearly 6 hours each way, so that a stranger, unaware of their existence, might run aground on the banks near San Blas, thinking himself to the southward of Raza point. On nearing the Negro, the sand-hills are lower ; some of a different character just show inland.

Rubia point, situated about 7 miles southward of Rubia head, is 40 feet high ; and Second Barranca point 11 miles to the southward, a similar hill, is covered with shrubs and grass, and has a low cliff in front of it, the only one hereabouts, and is therefore remarkable.

Raza point, 18 miles southward of Rubia head, has a round sand-hill about 30 feet high on it, and there are three or four flat-topped sand-hills about 5 miles to the south-west. Some persons have mentioned these hills or rather hummocks as remarkable, and as sufficiently showing which is the point ; but a stranger may find difficulty in recognizing them, particularly as their form may sometimes be changed by gales of wind.

The RIO NEGRO* separating the provinces of La Plata and Patagonia, falls into the sea between Redonda or Main point on the east, and Medano point on the west. These points are fronted by extensive banks between which is the bar and channel into the river. The north-east bank is hard sand and shingle. The south-west bank is chiefly a quick-sand, fine, and dark coloured ; during one night a vessel of 60 tons burthen was buried in it, although the water was smooth with little swell.

South Barranca hill situated about 3 miles southward of Rio Negro is a range of perpendicular cliffs 200 feet high, rising suddenly from the low land at the entrance to the river ; this with the North Barranca hill 160 feet high, 6 miles eastward of the river, will assist in identifying the entrance.

Heavy gales assist the torrents from the interior, in altering and shifting the banks at the entrance ; yet the main channel over the bar is stated to vary but little. But in places, in the river, where

* *See* Admiralty plan :—Rio Negro on chart No. 1,358, scale, $m=1$ inch.

formerly there was a depth of 3 fathoms, it has been reduced to about 3 feet.

Main point and Leading hill.—Main point is a hummocky sand-hill 40 feet in height, with a beacon surmounted by a cask, and a signal mast on it. From the eastward it appears as three hummocks, tolerably covered with verdure.

Flat point, on the eastern bank, nearly a mile within Main point, is sandy, 25 feet high, and covered with verdure. It shows a steep side to the south-west, is wedge-shaped, and a leading mark into the river.

At some distance up the river two headlands will be observed, one of which, Leading Hill, about 6 miles north-westward from Main point, is 130 feet high, and the mark of most use in entering the river. It may be seen from 3 to 4 miles outside the bar. It is the higher and the more eastern of the two headlands, having a small round-topped hillock at the south-west extremity, which slopes suddenly to the south-west.

Medano point, the west point of entrance, is bare and sandy. In very high tides it is overflowed, when the entrance of the river would appear three times its usual breadth. South point is a cluster of sand-hills half a mile to the north-west of Medano point. South Barranca, a hill 200 feet high, faced by a cliff, about 3 miles south-west of Medano point may assist in identifying the entrance. Both Main and Medano points are steep-to when abreast; by closing them, the opposite banks, which are dangerous, are avoided. Abreast of Main point the channel is only 300 yards in breadth.

Supplies.—Fresh provisions, in moderate quantities, some fire-wood, plenty of vegetables, and, during the season, abundance of excellent fruit, may be procured at San Carmen, a town situated on the side of a steep sandstone bank, on the northern or left bank of the river, 17 miles from the entrance. Encouragement and protection would make this a thriving settlement. The climate is delightful, the soil on the banks extremely rich, and watered by the periodical overflow of the river.

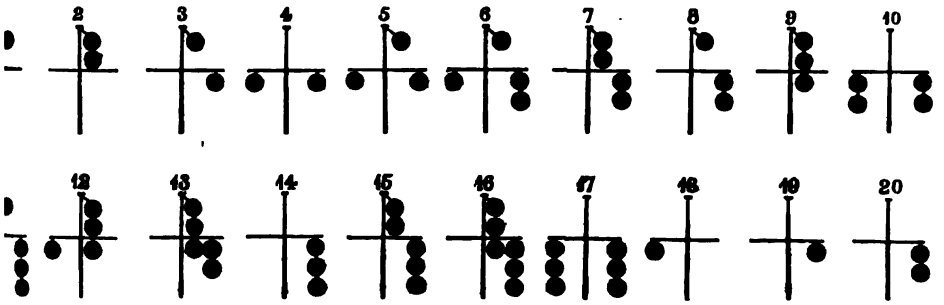
Bar.—The passage across the bar is not more than a cable wide, and at low water there is only a few feet on it. The maximum draught taken into the river by the pilots (in 1880) was 12 feet. Though vessels of slightly deeper draught may enter, with smooth water, they are liable to be detained for some weeks in the river

before they can get out. Such smooth water is rare on this exposed coast, and generally speaking, 11 feet is the utmost draught that may enter the river without incurring risk. The edge of the bar will always show either by breakers or by ripplings; rarely does a day occur on which there are no breakers; with any swell the breakers continue all round the bar, not excepting the channel.

Directly after high water, the ebb tide begins to set strongly out of the river, and over the North-east bank, and should a sailing vessel be met by it, she must either anchor, or stand out to sea if not well inside the bar and in plenty of water. Very few vessels have escaped that have once grounded on the banks or bar of this river.

Leaving the river is rather more difficult than entering, because of meeting instead of leaving the southerly swell. There are instances of vessels having been detained 40 days at the entrance, waiting for an opportunity to cross the bar. No vessel should make the trial without a commanding breeze, for light winds are treacherous, and they blow different ways on the river. North-east winds are the best either for entering or leaving.

Bar signals.—The following signals, made from the signal flagstaff at Main point, denote the state of the bar, and directions for entering the river, &c.



1. Vessels cannot enter.
2. Vessels can enter.
3. Vessel is seen.
4. Pilot is going out.
5. Steer according to the signals made, or for the pilot boat.
6. Do not approach the bar, as the weather looks threatening.
7. Cross the bar, following the signals given by the pilot boat.
8. Approach the bar, as it is the time to cross.
9. Pilot cannot go out for want of a boat; send a boat.
10. Cross the bar, which has a depth of 18 feet.

11. Vessels cannot enter during this tide.
12. Pilot boat cannot go out on account of the sea on the bar; pay attention to the signals.
13. There is only a depth of 12 feet on the bar.
14. Stand off until you have the landmarks in line; pay attention to the signals.
15. Remain off the bar until high water.
16. Approach the southern bay to meet the pilot boat.
17. Keep southward of the bar until the time for crossing, when you will receive signals for entering.
18. Keep more to port.
19. Vessel in the channel.
20. Keep more to the starboard.

The vessel must keep a flag at the masthead, dipping it when the signal is understood, then re-hoisting it.

Pilots. — A pilot, maintained by the Argentine government, resides at the entrance of the river, and who comes off to vessels wishing to enter, if the bar is practicable.

Tides.—It is high water, full and change, on the bar, during settled weather, at 11h.; springs rise 14 feet, neaps 10 feet. In the offing, it is 3 hours later. The tidal stream runs parallel to the coast from 2 to 4 miles an hour.

The ebb stream in the river runs at the rate of 2 to 6 miles an hour, according to the wind, the body of fresh water coming down from the interior, and the state of the offing tide. The flood stream seldom exceeds 2 or 3 miles an hour. When an unusually great body of fresh water is brought down, the ebb is at the strongest; and, on the contrary, the flood-tide is hardly to be noticed, though the water rises as usual. Like all large rivers having their sources in mountainous countries, it is subject to periodical inundations. The tide reaches a few miles above the town of San Carmen, during the dry season, where it is high water two hours later than at the mouth of the river.

LIGHT.—On South Barranca hill stands a lighthouse 143 feet high, from which is exhibited a *fixed* white light, visible in clear weather from a distance of 14 miles, between the bearings of S. 34° W. (through north) and S. 13° E.

Directions.—Anchorages.—In approaching the Rio Negro it is best to make the land to the southward, about the False Sisters,

or Bermeja head* (page 323). Being certain of the latitude, and making proper allowance for the tide, may justify a direct course for the river, but on no account should a vessel incur the risk of being set to the northward of Raza point. The land about Bermejo head is high, the water free from danger, and if set out of her reckoning during the night or thick weather a vessel will not run the risk of getting ashore. Northward of Raza point the case is reversed, as the flood tide sets strongly towards the San Blas banks. Many vessels have been wrecked, owing to this cause.

With Main point bearing N.N.W., or more northerly, approach the bar of the Rio Negro until the water shoals to 10 fathoms.

If circumstances do not admit of attempting the passage at once, anchor, or stand off again. Good anchorage, and a convenient place for waiting, is south-westward of the bar, in 8 fathoms, sand, with Main point bearing North, and the north-east end of South Barranca cliffs W.N.W. While the winds have northing and westing this is a good roadstead; but it must be quitted directly the wind gets to the southward or eastward, if threatening to blow strong. Heavy seas are sent in by southerly gales, and the strength of tide should be remembered.

The proper time for crossing the bar is during the last-quarter flood. The water does not rise during the last-quarter flood, and it is of material consequence that a vessel should enter the river before the ebb-tide makes out with strength. At this time the tide is setting strongly to the north-eastward, along shore over the bar, and the difficulty is to avoid being set to the north-eastward in crossing it. After high water this difficulty is increased, because the powerful ebb out of the river meets the tide flowing to the north-eastward, along shore, and they together sweep over the eastern bank at the rate of 3 to 5 miles an hour.

Leading hill on with the summit of Flat point, or just open westward of Main point beacon bearing N.W. ½ N. leads over the bar probably in the best water. (From its shoalest part, the north end of south Barranca bears about W. by S.)†

Keep the marks on until the end of the South Barranca bears W.S.W.; then steer N.W. ½ W. until the Barranca end is S.W. by W.

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* *See* view on Admiralty chart, No. 1,288.

† In 1880, the marks in use were, the beacon on Main point in line with another beacon, without ball, probably on Flat point, this may differ slightly from the old marks given above. In any case the river should not be entered without the assistance of a pilot.

Thence steer direct for Flat point, passing close to Main point; having passed which, steer close to Medano point, and anchor in 3 fathoms, mud, westward of a line joining Medano and Flat points out of the strength of the tide, unless intending to proceed farther up the river.

From thence to the town of San Carmen (or Patagones), the chart and the lead will suffice. If a vessel should ground, with a flowing tide, smooth water, and soft banks, she will not be injured; but, both for the bar and for the river, a local pilot should always be procured if possible. The banks alter, more or less, every year, although the main channel is nearly stationary.

For boats there is a safer entrance than the main channel. They should pass the South Barranca in 4 or 5 fathoms water, and steer about N. by E., till some bare sand-hills, rather inland, on the north-east side of the river, are distinguished. Steering for the second of these hills (South Channel hill) counting from the west, on a N. by E. ¾ E. bearing, will carry a boat at three-quarters flood into the river. At high water a vessel drawing 7 feet may thus cross the south bank. This is called the West channel, though channel there is none; but it is safer for boats to enter by this way, because they run less risk from blind breakers, which are common in the main channel. Also, if any accident does occur, the shore is close at hand, and the tide sets into the river.

CHAPTER IX.

RIO NEGRO TO CAPE VIRGINS.

Variation in 1893.

Rio Negro -	- 12° 40′ E.	Cape Three Points	15° 50′ E.
Port St. Elena	- 14° 50′ E.	Cape Virgins -	- 18° 30′ E.

The COAST* from the Rio Negro trends in a west-south-west direction 22 miles to Bermeja head, thence west and north-west 80 miles to port San Antonio, at the head of the gulf of San Matias. The range of hills commencing with the South Barranca, 200 feet high, near the Rio Negro extends to Belen bluff, a distance of 50 miles, with the slight break in Rosas bay. Their greatest height is 300 feet near Belen bluff. Between south Barranca and near to Bermeja head the land in-shore of the cliffs is so level as to appear parallel to the water line when seen from the south-eastward.

The bar of the Rio Negro is the only outlying danger between San Blas bay and port San Antonio.

GULF OF SAN MATIAS.—Bermeja head is an excellent point to make when approaching the Rio Negro, San Blas bay, port San Joseph, or port San Antonio. It will keep a vessel clear of numerous dangers which attend the approach to either of those places on a parallel, as is the frequent, but on this coast, dangerous practice. In the vicinity of Bermeja head the land is about 200 feet high.

* *See* Admiralty chart:—Rio Negro to cape Three points, with views, No. 1,288, scale, $m = 0 \cdot 06$ of an inch.

Near the head there are hummocks and irregular hills, nearly covered with verdure. At the north-eastern part of these, are two peaks, very small, yet showing distinctly when seen from the eastward. They stand nearly over two peculiar cliffs, which so resemble one another that they are known locally as the Two Sisters, the name originally applied to the west point of Rosas bay which they resemble.

Bank.—Westward and southward of Belen bluff, the *Beagle* had deep water excepting in one place, where two successive casts of only 15 fathoms were found, but the next cast gave no bottom; and as the shoal ledge could not be found again without great loss of time, it was left unexamined. There certainly is, however, a ledge of rocks there, and perhaps with less than 13 fathoms over them. The water appeared light coloured, although the night was very dark, and the lead had been carefully attended. In all other parts of the gulf of San Matias, there is deep water; with 30 fathoms from one to 2 miles off shore.

Tides.—The tidal wave comes up the coast from the southward, and rushes round Valdes peninsula with much strength, causing violent and dangerous overfalls off Valdes creek and Norte point. Part of the body of water thus going northward, separates, and runs round Norte point; thence to the port of San Josef the tide sets strongly, with ripplings and races, dangerous for boats, or very small vessels. The main body continues its progress to the northward, inclining to the west, until near Belen bluff, when it divides; one stream running to the north-west, the other to the eastward. Eastward of Belen bluff, the ebb sets faintly to the south or south-eastward; westward of the bluff it sets to the south-eastward (*see* page 365).

West of the meridian of Norte point, the south point of entrance to the gulf of San Matias, and northward of latitude 41° 50′ S., but little stream of tide is felt; though the water rises 24 feet. With a weather tide there is a very cross short sea in the entrance of the gulf.

Tide Creek.—At 10 miles westward of Belen bluff, there is a tide creek, in which is a depth of 3 or 4 fathoms at high water, but at low water it is dry. Westward of this creek, another range of cliffs, about 100 feet in height, commences, and, with one break, extends

about 18 miles, the extreme point being named Cliff end. To these cliffs succeed low land, with a shingle beach. Near, and in-shore of the cliffs, to the westward of Bermeja head, are irregular ranges of hills, tolerably covered with rough verdure. Rosas bay and Tide creek, appear when first made from seaward, like openings in the land, and the hills and cliffs on each side like islands.

PORT SAN ANTONIO.*—From Cliff end to Villarino point, a distance of 22 miles, the land is low, a few sand-hills, partially covered with grass and stunted bushes, alone rise above the shingle or sandy beach. Villarino, the eastern point of entrance, is low and sandy, with a few hummocks about 40 feet high, covered with rough grass and straggling bushes. Soundings will be obtained with the hand lead, only within a few miles from the land.

Port San Antonio harbour is perfectly sheltered from every wind, and small vessels may be laid ashore for a tide. It may, therefore, prove valuable, notwithstanding its remote situation and the barren nature of the surrounding country. Distant 30 miles only from the Rio Negro, perhaps the medium of future inland communication between Chile and the coast of Patagonia, it is well situated for commercial intercourse with the interior. The entrance, however, is much exposed to south-easterly winds, and at such times it would be imprudent to approach without a probability of speedily entering, as the vessel would be embayed, and have to contend with a heavy rolling sea.

Supplies.—Game, fish, and fuel are abundant; water is only to be obtained by digging wells.

Banks.—On each side of the entrance is a bank, partly dry at low water and steep at the edges. Lobos bank extends south, nearly 5 miles from Villarino point, and dries out nearly 3 miles from the shore. It is steep-to, shoaling suddenly from 7 to 3 fathoms; the western is named the Reparo.

Tides.—It is high water, full and change, at port San Antonio at 10h. 45m. The rise depends upon the wind, being between 18 and 30 feet. Between Villarino point and the Reparo bank the tide runs from 3 to 5 miles an hour.

Southward of the entrance, the stream of tide is not more than one

* *See* Admiralty plan :—Port Antonio, No. 1,327, scale, $m = 1$ inch.

mile an hour; but as the vessel nears Lobos bank its strength increases rapidly.

Directions.—Approaching port San Antonio, Direction hill and El Fuerte hills, on the north-west shore of the gulf of San Matias, will be seen before any of the lowland can be made out. If approaching from the southward, El Fuerte (Fort) is seen sooner than Direction hill; if from the eastward, the reverse. El Fuerte is 380 feet high, and it would be difficult to find a more singular resemblance to a regular fortification. Direction hill, 560 feet above the sea, has three small hummocks, close together, on its summit.*

Nipple hill, the highest land hereabout, 600 feet above the sea, is on a range of hills northward of the port, having a small hummock on its summit resembling a nipple.

Steering towards the port, keep Direction hill bearing W.N.W. until El Fuerte bears S.S.W., from which position, Nipple hill will be seen in line with the hummock on Villarino point bearing N. by E. easterly. Then steer in with the Nipple just open of the west extremity of Villarino point until the vessel is half a mile from that part of the point, from whence steer by the eye, close to the bank on the east side, round the point, proceeding to the most convenient berth.

For a large vessel, the best time is about two-thirds flood, but for most vessels the last-quarter ebb, should be chosen as the time for rounding the tail of the Lobos bank, so as, if possible, to arrive off Villarino point at low water. When there all is safe and easy. The water is always smooth, and the only inconvenience is the rapid tide. A sheltered berth, suited to the object in view, may be gained by warping when the tide suits.

Caution.—It must, however, be remembered that the fairway is not sufficiently examined, particularly along the west side of Lobos bank; although enough has been done to ascertain and show the nature and practicability of the passage. Before entering in a large vessel the fairway should be examined, and shoal heads marked by the person who is to pilot the ship into the harbour, to insure his acquaintance with the marks, and to guard against any shifting of the banks, which may have occurred in so rapid a tideway, since the survey.

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* *See* view on Admiralty chart, No. 1,288.

Outer Anchorage is good in from 10 to 30 fathoms, between the end of Lobos bank and El Fuerte, as well as to the southward and eastward of that bank; the ground being quite clear, either fine sand or a soft greenish sandy mud. The shelter is good, excepting with south-east winds, which do not often blow, and still less often with violence.

SIERRAS de SAN ANTONIO.—Continuing along the coast southward from El Fuerte, the Sierras de San Antonio next attracts notice. The highest part of this peaked range is about 1,700 feet above the sea, and visible from 20 to 30 miles from the land.

All this west coast of the gulf of San Matias is bold, exposed, and steep-to. From the point of the Sierra, to the southward, the coast is chiefly cliffy, but with intervals of low land. The cliffs are from 100 to 200 feet high, nearly perpendicular, and are composed of loose earth, mixed with shingle and vast quantities of fossil shells. The shore is sandy, fringed by low-water rocks.

VALDES PENINSULA, 53 miles long, north and south, by about 25 miles across, is joined to the main by an isthmus 20 miles long by 7 across, on the north and south sides of which, lie respectively, port San Josef and Nuevo gulf.

Port San Josef.*—This basin is 24 miles in length and 10 miles in width, with an entrance from 2 to 3 miles wide; on each side of its entrance are bold cliffy headlands, from 100 to 150 feet high, with deep water to seaward, but a ledge extends from one to the other under water, causing, when the wind opposes the tide, a heavy rippling. The port is free from interior obstructions or danger, but the entrance has an unpleasant appearance owing to this rocky ledge crossing it, over which the water ripples so much that a stranger would hardly think it safe to enter. The least depth found in that channel is 11 fathoms, but the tide sets so strongly over the narrow ledge that sounding upon it is not easy. Many vessels have entered at various times, and as no one has yet encountered danger it may be supposed that none exists, excepting within half a mile of either head.

Anchorage.—The best anchorage in the bight eastward of the eastern head. Northerly winds send much sea into the southern bight.

* See view on Admiralty chart, No. 1,288.

It is reported that a short heavy cross sea gets up with any strong wind, although the gulf is nearly landlocked. Fuel may be cut in the south-west part of the bay from stunted trees, but near the shore there is no appearance of fresh water. To the eye, all is barrenness and desolation.

Tides.—It is high water, full and change, within Port San Josef at 10h. 0m. The tide rises from 20 to 30 feet, and the stream rushes between the heads from 3 to 5 miles an hour.

Tide races.—A vessel of 80 tons, bound from the Rio Negro to port San Josef, was beset by one of these races when about 12 miles north-east of the entrance to that port. No bottom could be found with the lead; the sails were almost useless, notwithstanding a strong wind, owing to the violent motion of the vessel; some of the crew ran aloft to avoid being washed overboard; others ran below. After being the sport of the waves during two hours, carried with the tide, and unable to get clear, so much damage and inconvenience was caused, that getting out of the race, was followed by a change of purpose, and the immediate return of the vessel to the Rio Negro without again attempting to enter port San Josef.

The races to the eastward of Norte point and Valdes creek are yet worse, but their height and violence vary as much as the winds and tides by which they are occasioned.

Norte point.—From the east side of port San Josef to Norte point, a distance of 28 miles, there is a continuous cliff from 60 to 100 feet in height. No high land appears in-shore; all looks low, bare, and sun-burnt. No dangers are known to exist, but to small vessels the races of tide met between San Josef and Norte point, are troublesome, if not dangerous. Norte point is lower than the adjacent cliffs, and a reef extends off about a mile. In the offing is deep water.

Rocky patches.—From Norte point to Valdes creek, about 30 miles to the southward, the land is low, mostly a single beach; off this piece of coast are the worst tide races, being occasioned by the rush of water across shoal and uneven ground lying from 2 to 10 miles off shore south-eastward of Norte point, and the rocky patches lying 6 miles eastward of Bajos point. There are no marks on the land by which the shoals can be avoided. In a sailing vessel it is, at least, prudent to avoid going nearer to this shore than

15 or 20 miles. Sometimes the overfalls extend 15 miles from the land, at others they are hardly 5 miles distant; depending on wind and tide.

Valdes creek.*—At 28 miles southward of Norte point is the entrance of this creek, which may be known by the shingle beach ending; the land to the northward being low, that to the southward high and cliffy; also by a line of cliffs commencing at Cantor point, on the south side of entrance, and continuing to the southward to Ercules point.

Ercules point, 8 miles southward of Valdes creek, is a white cliff, 225 feet high; when first seen it appears perpendicular, or rather over-hanging; close to the northward of it are two perpendicular cliffs of the same height, off which a shoal ledge of tosca extends 2 miles to seaward, and 3 miles along shore.

Valdes creek is a dangerously deceiving inlet of a singular character. The entrance is usually one-third of a cable in breadth, but sometimes it is entirely blocked up by shingle. The tides run most rapidly through the opening, and up the long narrow passage, which extends to the northward, at the rate of 4 to 6 miles an hour. A heavy surf breaks across the entrance, when there is any swell.

The depth of water on the bar is quite an uncertainty, depending upon the length of time that has elapsed since a south-east wind has heaped up shingle at the entrance. The strong tides scour out a channel as repeatedly as the gales block it up. It is an unfit place for any craft unless obliged to enter from some urgent cause.

In approaching, it is absolutely necessary to keep well to the southward, to avoid the races, as far as Ercules point; and then run to the northward along shore. The creek should be entered with the flood tide and the wind off shore, by backing and filling, with the vessel's head to the southward. There is no room to wind inside, and when bringing up, head-way will be necessary to lessen the strain upon the cable.

Delgada point, the south-eastern point of Valdes peninsula, is sloping and green, and 200 feet in height. A tosca ledge extends to the southward and eastward a distance of 1½ miles.

Lobo peak, nearly 6 miles westward from Delgada point, rises only 15 or 20 feet above the table range. From the southward it appears double.

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* *See* view on Admiralty chart, No. 1,288.

Nearly all the cliffy points between Valdes creek and Nuevo gulf have rocky ledges extending nearly a mile from high-water mark. In some places they extend still further, and should be allowed a berth of 2 miles.

NUEVO GULF* is easily known by the two well-defined headlands, Nuevo head on the north-east, and Ninfas point on the south-west side of the entrance. Nuevo head is 200 feet high, steep-to, and no danger exists off it excepting a few tosca ledges close to the shore.

Ninfas point, distant 7 miles south-west from Nuevo head, is 240 feet above the sea. It makes as a double point. Although bold to the eye, it ought not to be approached nearer than 2½ or 3 miles.

Reef.—Rocks and tosca ledges extend east and east-north-eastward of Ninfas point, and at the north side of the point there is a reef extending to the north-east nearly 2 miles. At 1½ miles from the shore the rocks dry at low water, with 7 fathoms close to. The tide rushes over them into Nuevo gulf at the rate of 5 or 6 miles an hour, causing, with a westerly wind, a heavy and dangerous rippling, the swell from which is felt entirely across the gulf, and is dangerous for small craft or open boats. In mid-channel there are no ripplings, and the tide is sufficiently strong to carry a vessel to windward, while hove-to in a fresh gale. When once well inside the head the tide is much less strong, and the sea longer and more regular.

On the south side of the gulf there are several good anchorages, off the shingle or sandy beaches, between the different heads.

Cracker bay† is the second bight westward of Ninfas point, between two white cliffs. Although bold looking, these cliffs, like the rest of the projections on the coast, have rocky ledges, which dry at low water, extending from them for the distance of 2 cables. These are the only dangers in approaching the bay.

A pole, surmounted by a cask, indicates the centre of the bay.

Anchorage.—There is a good anchorage in 10 fathoms, mud, nearly midway between the east and west cliffs, and at a distance of half a mile from the beach; the holding ground is good, and

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* *See* Admiralty chart:—Nuevo Gulf and adjacent coast, No. 1,290, scale, $m = 0{\cdot}18$ of an inch.

† *See* Admiralty plans:—Cracker bay, and port Madryn, scale, $m = 2$ inches, on chart, No. 1,290. From H.M.S. *Volage*, 1876.

sheltered from the prevailing westerly winds; but an easterly wind would undoubtedly bring in a heavy swell.

The anchorage in Cracker bay is used in preference to that of port Madryn by vessels bringing cattle for the Welsh settlers at Chupat, as fresh water in small pools is found near the beach at the head of the bay.

Port Madryn, so named by the Welsh settlers of Chupat, is the westernmost bight in Nuevo gulf, and is surrounded by a range of table hills 300 feet high; between the hills and the shore, sandy hillocks, 20 to 40 feet high, and thinly covered with brushwood, intervene; the beach in several places is formed at the base of white cliffs, from 50 to 80 feet high.

Railway.—There is a railway to Chupat from port Madryn. A train runs about once a week from November to March, and two or three times a week from March to October. The village near the railway station is named Trelew.

Telegraph.—There is telegraphic communication between port Madryn and Trelew.

Shoals.—A shoal with 2 to 3 fathoms water extends off Cave bluff, the eastern point, for a distance of 7 cables in a north-west direction, and one mile to the north-eastward. At a distance of 1¼ miles in a north-east direction a depth of 5 fathoms is found, and 11 fathoms at a distance of 1½ miles, but to the north-west of the cave the water deepens suddenly, the 10-fathom line being 6 cables off.

A shoal is situated about 3 miles eastward of port Madryn, and extending along the shore nearly 2 miles from East point (the point next eastward of Cave bluff), to the next point again to the eastward, which has been named Shoal bluff. On this shoal a depth of 2¾ fathoms was obtained, with East point bearing South, distant about one mile; depths of 4 and 5 fathoms being found on the apparent edge of the shoal ground to the eastward. The eastern part of the shoal ground was sounded over, the least water obtained being a depth of 3¼ fathoms, situated with East point bearing S. 65° W., distant about 1½ miles; from that position soundings of 4 to 7 fathoms were found for a distance of half a mile eastward and northward.

From the appearance of all the points on the south shore of Nuevo gulf, it is probable that banks stretch off them; vessels should give that shore a wide berth until it is properly surveyed.

The reported position of the shoal (East point bearing W. ¾ S., distant 6 miles) on which the *Gulf of St. Vincent* struck, was examined, but no indication of shoal water could be obtained; as, however, this examination was not very minute, the *Gulf of St. Vincent* shoal is retained on the charts for the present, although it seems probable that the bank on which that vessel struck is that found by the *Flamingo*.

Anchorage.—Port Madryn affords a good anchorage in 10 to 12 fathoms, mud, at about a mile from the shore, with Cave bluff bearing S.E. ½ E., distant a little more than a mile; or eastward of the bluff, abreast the landing. The latter is stated to be the better, by H.M.S. *Amethyst*.

Pier.—Vessels of 15 feet draft can lie alongside the pier at Port Madryn, at high water and discharge cargo into railway wagons.

Landing may be effected with on shore winds, at half a mile eastward of Cave bluff; and on the western side just clear of the rocks. More to the westward of the cave, owing to the shelving of the shore, it is scarcely practicable except between half flood and half ebb. Landing may also be effected about half a mile north of the pier.

Supplies.—Hares and partridges may be shot in the vicinity of port Madryn, but they are not numerous. Fish of good quality, particularly smelt, may be caught in large quantities either with the seine or with hook and line. Abundance of brushwood for fuel may be obtained.

There is no water to be obtained at port Madryn, nor is there any to be found on the road to the settlement of Chupat, a distance of over 40 miles; even the small quantity required by the man who was found in charge of the stores awaiting conveyance to Chupat had to be brought from thence. The water obtained from a well dug by the crew of H.M.S. *Volage* was brackish. Beef, mutton, eggs, etc. may be obtained from the Chupat colony, by giving notice, at fairly moderate prices.

Pyramid road.—The northern part of the gulf is fringed with steep cliffs. In the north-east corner there is a remarkable rock named the Pyramid, which forms the western point of Pyramid road.

The road is sheltered, having good anchorage, except with southerly winds. The best berth is with the Pyramid bearing West, or W. by S. No tide is felt here. In ordinary weather landing may be effected in a small cove in the north-west corner. There are three fresh water lagoons about 6 miles north of Pyramid road, but they are dry in summer.

Tides.—It is high water, full and change, in Nuevo gulf at 17h. 15m., springs rise 13 feet, neaps rise 10 feet.*

ENGAÑO BAY.—CHUPAT RIVER.—From Ninfas point the coast trends in a south-westerly direction for a distance of 40 miles to the entrance of Chupat river, in the south-west corner of Engaño bay. This shore is cliffy, similar to the coast eastward of Nuevo gulf, and with no outlying dangers. In Engaño bay the water is shoaler than that near the higher land. Around the bay, between the North and South cliffs, the land is low and sandy, with many sand hummocks near the beach. Southward of the river is a range of table-land, from 50 to 60 feet in height, ending in white chalky-looking cliffs. Castro point is the north-east termination of the table-land.

Bar.— The entrance to the Chupat is just where the sand hummocks end (on one of which is a beacon), and the cliffy shore again begins. The entrance is partly concealed by a ledge of rocks which crosses it, and, at low water, quite hides it from view. Between this ledge, which uncovers at half tide, and the beach is a shifting bar with scarcely a foot of water on it when the tide is out, but at high water there are from 7 to 12 feet, according to the state of the tide. Within the reef the water is at all times quite smooth. Near the mouth the river is not more than 60 yards wide, and is 5 feet deep at low water; higher up it gets broader, but not deeper. At low tide the water is quite fresh at the bar.

Vessels exceeding 8 feet draught use port Madryn, which is often the readiest way of communication with the colony, as the Chupat bar is sometimes impracticable for a whole week.

Beacon.—A beacon is erected on the round sand-hill, north of the river, which assists in identifying the entrance.

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* In April 1871 a rise of from 20 to 25 feet was observed by the officers of H.M.S. *Cracker* in the western part of Nuevo gulf.

Pilot.—Small craft wishing to enter the river may obtain the services of a pilot by sending into the river for him, who, with the Argentine Government harbour master, resides 2 miles above the bar, within sight of the anchorage.

Anchorage under very favourable circumstances may be obtained off the river, in 5½ fathoms, but altogether exposed.

H.M.S. *Amethyst* anchored in 7 fathoms, pebbly bottom, about 2½ miles off shore, with point Castro bearing S. 18° W., the beacon S. 77° W., and the wreck of the schooner N. 70° W. It is said that the anchor sinks into clay beneath the pebbles, requiring that it should be lifted at least every three days, or it is not likely to be recovered.

Welsh Colony.—It was at port Madryn that the original settlers, chiefly from Wales, now established at Chupat (sometimes called Chubut) landed in 1865. The settlers in 1891 numbered about 2,700 people. Their farms are scattered along the banks of the river Chupat for a distance of 23 miles from the sea. There is a village near the mouth of the river, and a village named Caimen about 20 miles from the mouth. The prosperity of the colony is increasing, and their flocks and herds are rendered safe from drought by the supply of water from the river by means of an artificial canal 20 miles long, fitted with sluices. The settlers are on friendly terms with the Indians, who bring horses, ostrich feathers, the skins of the guanaco and other animals to barter for groceries, spirits, and tobacco.

The exports consist of wheat, butter, ostrich feathers, and skins of animals obtained from the Indians. Value of imports about £29,000; exports £25,000, during the year 1892.

The climate is dry and said to be very healthy. Fogs and mists are unknown; rain seldom falls in large quantities, and there is little or no dew.

Tides.—It is high water, full and change, at the entrance of Chupat river, at 5h. 30m., and the rise is from 6 to 12 feet. The ebb in the river runs from 2 to 4 miles an hour; the flood is not felt more than 6 miles up the river.

Off the entrance the flood runs north-eastward and the ebb south-westward, nearly in the direction of the shore, and from one to 2 miles an hour.

Directions.—Small craft wishing to enter the Chupat should avail themselves of the services of a pilot, who buoys the entrance

from time to time as the bar shifts. Boats or flat-bottomed barges might be tracked up by men or horses to a great distance. The river is free from obstacles, and the banks are firm and level. The best time to leave the river is before high water, with the last quarter flood, because, when the ebb makes, it sets directly upon the reef.

The COAST from Delfin point, 12 miles south-west of Chupat river, to Lobos head and Union point is high and bold, the water being deep, and free from danger. The cliffs have a chalky appearance, and consist of a light coloured sand and clayey earth, with dark horizontal strata.

At Delfin point, 270 feet high, a small conical hummock is seen above the table-land, which appears double, saddle-shaped, and rugged when seen from the northward. Ten miles south of Delfin point is Hidden islet, and so much like the cliffs near, that one might easily run past without seeing it. Union point, 13 miles farther to the southward, is rather low and rocky. Here the character of the coast changes, bold cliffs and extensive ranges of table-land no longer meet the eye, the shore becoming lower and more uneven.

Tombo point, 13 miles to the southward of Union point, is low. There are rocks off the point, and a ledge extends half a mile to the north-eastward. A depth of 7 fathoms was found at one cable from the shore, but the water appeared to be shoaler farther off. On the north side of the point, inside the reef, there is an anchorage where small craft might find shelter from south-east winds. Sealing vessels anchor there at times.

Atlas point, 6 miles south of Tombo point, forms the northern head of Vera bay. It is 70 feet high, and shows a smooth slope, terminating in a low rocky point when seen from the northward or southward, but in a rugged ridge of rocks, if seen from the eastward. A ledge of rocks under water extend off nearly 2 cables from the point.

Inland, between Atlas and Tombo points, is mount Triste, 300 feet above the sea.*

VERA BAY.—At one mile south-west of Atlas point is an anchorage for small craft, drawing less than 12 feet. It is formed by a reef of rocks, lying south-west and north-east, nearly a mile in length, and half a cable broad. A vessel may enter from the north-

* *See* view on Admiralty chart, No. 1,288.

east or from the south-west, remembering that in each entrance there is only a depth of 12 feet at low water with a rocky and uneven bottom. Inside, opposite to the shingle beach is a good berth, in 15 feet at low water, over a bottom of coarse sand, shells, and sandy mud.

With a strong wind from south-eastward a sea may be thrown into this corner, over and around the natural breakwater, from the beginning of the last quarter flood to the end of the first quarter ebb, during which time the reef is covered; the beach, however, does not show the effects of much sea. The tide sets through between the reef and the shore, about a mile an hour. The land is low close around the bay, but rather high ground is seen in-shore.

Two islets, with rocks near them, lie near the middle of Vera bay, about 6 miles south of Atlas point.

Raso cove.—Cape Raso, the southern point of Vera bay, is level, and rather low, and there are a few rocks close to its extreme point. At 2 miles north-west of the cape is Raso cove, a good anchorage with all winds, excepting those between N. by W. and N.E. This cove is free from danger; but on the east side the ground is hard and stony; in the middle, and near the west side, there is good holding ground, a stiff yellow clay. Sand is shown by the hand-lead, but underneath is clay. There is neither fresh water nor any firewood, except a few straggling bushes.

SALABERRIA REEF.—In approaching this part of the coast from the northward, there are several rocks near the shore very little above water, and there is a considerable reef in the offing named Salaberria, the north-east extreme of which is a dry rock 4½ miles E. by S. from cape Raso, and N.E. ½ N. 8 miles from cape San Josef. This ridge probably projects off from cape San Josef, for there are two dry rocks in the same line of bearing; one at 1½ miles and the other at 3½ miles from that cape, besides several patches which break. The tide sets rather strongly along the shore, which is fronted by reefs for 2 or 3 miles off. Great caution should therefore be used in approaching the coast, as the water is deep, and, if becalmed, it may be necessary to anchor in 30 fathoms water.

CRUZ BAY.—Should Salaberria reef be as continuous as it appears, there ought to be good riding in Cruz bay, between cape Raso and cape San Josef. New cove, also called Santa Cruz bay, close to the northward of cape San Josef, is small and exposed to east

winds. West cove, in the south-west corner of Cruz bay, has not been examined.

PORT SANTA ELENA* lies about 3 miles westward of cape San Josef, and its approach may be easily known by the remarkable hummocky hills on that cape.

Florida reef which covers at three-quarters flood, is about one cable in extent, and lies about three-quarters of a mile W. by S. from Acerteda islet. At a quarter of a mile westward from the reef is a bank, with only 12 feet water; both of these must be avoided in working into the port.

Anchorage.—The best anchorage is at the north-west corner of the port, in 6 or 7 fathoms, but not too near the shore, for when the sea is heavy the ground-swell breaks for some distance off.†

Two rocks about awash at low water, are reported to lie half a cable off the beach, westward of St. Elena peninsula.

Supplies.—The water that is contained in the wells on the western shore of the port is too brackish to be worth consideration; nor is there any fresh water to be obtained from any part of the harbour. Of fuel, a temporary supply may be procured from a small shrubby tree which is tolerably abundant here. Guanacos, ostriches, armadillos, and the cavia or Patagonian hare, are to be procured, as are also wild ducks, partridges, snipe, and rail, but fish seem to be scarce. The guanaco affords an excellent food, but it is a difficult animal to approach; one that was shot, when cleaned and skinned weighed 168 pounds. The Indians sometimes visit this part of the coast, but principally for the purpose of burying their dead.

Tides.—It is high water, full and change, at port Santa Elena at 4h., springs rise 17 feet.

CAMERONES BAY lies between the south head of port Santa Elena and cape Dos Bahias, a distance of 22 miles, and in it the coast forms two bights, the southernmost of which is considerable, and may probably afford good anchorage. The shore of the bay is rocky

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* *See* Admiralty plan:—Port Santa Elena, No. 551, scale, *m* = 3·1 inches.

† The anchorage looks dangerous in southerly winds; a very uncomfortable swell sets in with the wind from South to S.S.E., force 2 to 3.

as far as Fabian point, where it changes to shingle, and so continues as far as the cape. Along this shore, and especially at the headland, the tide runs from one to 3 miles an hour, nearly N.N.E. and S.S.W., rising from 8 to 12, and sometimes even to 15 feet.

In the depth of Camerones bay, there is a high rocky islet, with two lower and smaller ones to the east and north, all of which are whitened by birds, and so named Blanca islets.

Cape Dos Bahias is a rounded point, with a hill close to the sea, on its most projecting part. A ledge of rocks extends about one mile north-east of the cape. Moreno islet, 2 miles north-west of the cape, 3 cables from the shore, is high, rocky, and of a dark colour.*

GREGORIO BAY, about 6½ miles to the southward of cape Dos Bahias, and just northward of Leones isle, is exposed to south-east winds, and somewhat difficult to enter, because of the strong tides setting past it. There is, however, good shelter from the prevailing winds.

ISLETS.—Between cape Dos Bahias and Gregorio bay, is Sola island, about 90 feet high, and the Aguilones islands about half a mile off shore; in the offing, about 4 miles off shore, is Arce island, about 90 feet high. The islets have deep water near them and are, therefore not dangerous.

Rasa islet, bearing S.E. ¼ S., distant 11 miles from Dos Bahias cape, is a flat topped gray rock, almost awash at high water; it lies in a N.N.W. and S.S.E. direction, and is divided into two nearly equal parts by a narrow channel.

Landing on Rasa islet, even when the sea is smooth, is difficult to effect, as the base of the cliff forming the coast line is much worn by the action of the sea, and overhangs. It is much frequented by seal hunters, and during the season many sea lions are captured.

A reef extends one-third of a mile southward of the islet; this same reef is stated by Fitzroy to extend one mile off. At night and during thick weather the islet should be approached with great caution.

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* *See* Admiralty chart:—Cape dos Bahias to Tova Island, No. 553, scale, m = 0·8 of an inch.

GULF OF ST. GEORGE.—LEONES ISLE, in lat. 45° 3′ S., long. 65° 37′ W., lies off the north-east point of the gulf of St. George, and 7 miles south of cape Dos Bahias. It is 280 feet high, 2 miles long east and west, 1½ miles broad, and covered with brushwood; on the summit stands a stone pyramid which forms a good landmark. A reef on which the sea always breaks, extends nearly half a mile from Lanaud peninsula, the south-east extremity of Leones isle; the isthmus between this isle and peninsula is covered at half tide.

English bay, situated on the northern shore of Leones isle is 1½ cables deep and one cable wide with from 3 to 4 fathoms water.

French bay, on the south-west shore of Leones isle, is protected from the westward by Ship isle, and from the southward by South-west isle which is low, rocky, and connected with Leones isle by a ridge which dries at half ebb.

Ship (Harbour) isle is low and rocky, with shoal water extending some distance from its north-west point; at 2 cables west of the western extreme of this isle lies a dangerous rock, on which the sea generally breaks.

Anchorage.—The northern entrance to this bay, between the north-west point of Ship isle and the west extreme of Leones isle, is about 2 cables wide with 12 fathoms water; the southern entrance, in which there is generally a heavy swell, also the southern part of the bay, is very shallow. The anchorage is in 6 to 8 fathoms good holding ground, on the north side of Ship isle, and nearly abreast the French establishment on the Leones shore, with shoaler water farther southward. Oil and guano are exported.

There is good landing on a gravel beach at the head of a small creek near the establishment.

Directions.—In approaching this anchorage, the set of the tide should be considered, in order to determine whether to pass round the north or round the south side of Leones isle. The flood tide runs strongly to the eastward round the northern side, between it and the main land. The tide sets directly through the anchorage, causing eddies which will turn a ship round at her moorings against a strong breeze; this and the strength of the tide setting between the isles and the main, are some objections to anchoring here.

Leones channel.—St. Roque point, about one mile west of Leones isle, on the main, is low and rocky, with a hummock upon it. A rock named Black head, covered at high water, lies south-west of the point, about a cable distant. While the flood tide is running, a vessel ought to give it a good berth, as the tide sets rather towards it, or to the north-eastward from 3 to 5 miles an hour. There is no other danger in the passage between Leones and the main.

Passage bay, one mile north-east of St. Roque point, affords good landing.

The tides set to the eastward during the flood, crossing Passage bay at the rate of 3 miles an hour, and causing much rippling.

St. Roque bay.—From St. Roque point the coast trends north-west three-quarters of a mile to St. Roque bay, which is nearly half a mile deep and 2 cables wide at its entrance. Anchorage cannot be recommended in this bay, as the depths are irregular and a heavy swell occasionally sets in.

St. Antonio peninsula,* 295 feet high, at 1¾ miles westward of St. Roque point, is joined to the main land by an isthmus composed of gravel, 650 yards long, and 140 yards broad. A rock dry at low water and steep, lies near the west side of Cabo del Sur (South cape) the south extreme of St. Antonio peninsula.

GILL BAY, which is formed by St. Antonio peninsula and the north shore, is about one mile deep and three-quarters of a mile wide; in the middle of the bay lies basin bank (half tide island), rocky, a quarter of mile long east and west, and covered at high water; there are depths of 4 to 5 fathoms close around, and 3½ fathoms at 2 cables south-east of this bank.

The Oven, an inlet at the head of Gill bay, extends half a mile in a northerly direction and terminates in a lagoon, part of which dries at half tide; the entrance to the Oven is nearly a cable wide with 4 fathoms water, decreasing to 12 feet at half a mile within; the cliffs rise perpendicularly on both sides to a height of 160 and 190 feet. The lagoon abounds with shell fish.

A well of fresh water is situated in the northern ravine on the east side of the Oven, and afforded excellent drinking water during the stay of Captain J. B. Olry, of the French Navy, 1876.

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* *See* Admiralty plans:—Egg harbour and Gill bay, on sheet No. 552, scale, m = 6 inches.

The best anchorage in Gill bay is in 8 fathoms, at 3 cables north-west from Basin bank.

Southerly gales send a heavy swell into Gill bay, as well as into Egg harbour.

EGG HARBOUR (Port San Antonio) situated between San Antonio peninsula and Valdes island, 230 feet high, is sheltered from all winds except those from south-east. It is one of the best ports on the coast, and small vessels in entering may pass on either side of Valdes island, and steer by the eye, as there is no hidden danger. Southerly winds send in a good deal of swell, but cause no further inconvenience The southern entrance to this harbour is 3 cables wide with general depths of 8 and 9 fathoms; at 1½ cables from the east extreme of Valdes island there is a depth of 4¾ fathoms with 6 to 7 fathoms close around. The northern entrance is 2¼ cables wide, with 9 to 18 feet water.

The best anchorage in Egg harbour is in about 6 fathoms, gravel over clay, with north extreme of Valdes island in line with south extreme of Cayëtano islands bearing West; small vessels may anchor near Valdes island.

Excellent fish may be caught in this harbour; and rabbits on Valdes island.

Tides.—It is high water, full and change, in Egg harbour, at 4h. 0m.; springs rise 17 feet. The flood tide sets through the harbour from west to east at about 1½ knots an hour; the ebb is scarcely felt.

Los Frayles.—At 1¼ miles westward of Valdes island lie Los Frayles, consisting of three rocks nearly awash at high water, with deep water close around. At one mile N. by E. ½ E. of Los Frayles is a rock of 4½ fathoms.

CAYËTANO BAY, situated 2 miles westward of Egg harbour, is partially sheltered from southerly winds by the Cayëtano islands, which extend nearly a mile in a north-east and south-west direction; the southern entrance, between the easternmost of these islands and Guanacos point, is half a mile wide, with depths of 8 to 11 fathoms; the northern entrance is about a mile wide with 12 to 18 feet water.

Temporary anchorage.—Small vessels may obtain temporary anchorage in 4 to 5 fathoms, gravel, with the east extreme of the largest Cayëtano island, bearing South, distant about 2 cables.

Water.—Moderately good drinking water may be obtained by digging in the gravel some distance from the beach in a valley on the north-east side of Cayëtano bay.

Arredondo bay, the entrance to which lies 2 miles westward of Cayëtano bay, affords shelter for small vessels; there is generally a swell setting into this bay, but the holding ground is good.

PAN DE AZUCAR.—This island, lying nearly 2½ miles westward from Los Frayles, does not resemble a sugar-loaf; its summit is uneven and rocky, and 176 feet above the sea. There are rocks and reefs close around, and dangerous ones between it and San Pasqual (Molino) reef, Castillos point, and port Melo. This portion, of which little is known, must be avoided.

PORT MELO.—About 2 miles west of Arredondo bay, the coast recedes and forms a bay 2½ miles deep and 3 miles wides, having in it two groups of islets, the southern named Escobar and the northern Laguna; between these islets and the eastern shore of this bay lies port Melo, the north and north-west parts of which dry at half tide.

Anchorage may be obtained in port Melo in about 4 fathoms water, with Portugal point, the east entrance point of the port, bearing E.S.E.; the best position is in 5 fathoms, sand, with Portugal point bearing S.S.E.

It is very rocky, and too much exposed to southerly winds to be valuable as a port.

Tides.—It is high water, full and change, at port Melo at 3h. 40m., springs rise 15 feet. The tides off this part of the coast are strong, running along the land at the rate of 2 or 3 miles an hour. Off the projecting points, and in confined passages, their strength is of course increased, and causes heavy ripplings when opposed to the wind.

Castillos point (West point) 4 miles west of port Melo is fringed by rocks, some of which extend more than a cable from the shore; three-quarters of a mile south-eastward are the Cangrajos rocks, and on the south-west side of Castillos point there are several islets and rocks, the principal of which are Long islet, Flat islet, and White rock; landing may be effected on the main land abreast Flat islet.

Between Castillos point and cape Aristazabal, a distance of 25 miles to the westward, are several bights and coves, though none of them are worth notice as fit places for anything larger than a decked boat.

TOVA ISLAND,* situated 6 miles south-west of port Melo, is 4 miles long in an E.S.E. and W.N.W. direction; it is divided at high water into four parts, the westernmost and largest, 128 feet high, is covered with vegetation; the easternmost is low and rocky, terminating in East islet. At three-quarters of a mile to the eastward of East islet lies a dangerous reef covered at high water; in the channel between there are depths of 8 to 12 fathoms. There are several rocks above and below water, extending about a mile from the south-west shore of Tova island, the principal of which is Goëland rock, situated a little over one mile from the west extreme of the island.

Supplies.—Rabbits are found on Tova island, and quantities of fish may be caught with the seine in the channel between the islands. Shell fish are also plentiful, but cause colic. Water may generally be obtained at Watering point, where there are rocky pools in which rain-water accumulates. From September to April the island is covered with penguins, and in the valleys there are quantities of guano. At Castillos point, on the main, partridges, hares, and guanacos may be shot.

Penguin rock, covered at high water, lies a quarter of a mile northward of East point, the north-east extreme of Tova island.

Anchorage bay, situated 1½ miles west of East point, affords a well sheltered anchorage in 4½ to 5 fathoms, gravel over clay, with the centre of Gull islet, bearing E.S.E., distant 3½ cables. Gull islet which has a stone pyramid on its northern part, is connected with Tova island at low water. The heaviest squalls are from south-west.

A strong tide is always setting through between the island and the main.

North-west bay at one mile west of Anchorage bay, affords good anchorage in 7 fathoms, gravel and clay, with the pyramid and beacon on the western shore in line, and a short distance east of the line of the two beacons on the southern shore. These leading marks

* *See* Admiralty plan :—Tova island on sheet, No. 552, scale, *m* = 6 inches.

on south shore, when in line, appear to lead very close to the westward of Sea Lion rock.

Sea Lion rock which covers at high water, with 8 to 12 fathoms close around, lies three-quarters of a mile north of the north-west extremity of Tova island. It always breaks.

Medrano rocks and Robledo islets.—Medrano rocks are a dangerous cluster of rocks, awash at low water, lying 2 miles S.E. by S. from the east extreme of Tova island. The sea breaks upon it with violence at most times.

At 5½ miles W. ½ S. from these rocks, and 2¼ miles from the south-west side of Tova island lies Great Robledo, consisting of three islets about half a mile in extent; Little Robledo lies 1½ miles W. by N. from Great Robledo, with 11 to 23 fathoms rock, between.

Tides.—It is high water, full and change, in Anchorage bay, Tova island, at 3h. 45m.; springs rise 18 feet.

LOBOS and GALIANO ISLES, lying in-shore, to the westward of Tova, are beset with rocks. Inside these islands is Bustamante bay, open and exposed to south-east winds; several rocks lie near the middle. The Viana isles lie 4 miles eastward of port Malaspina, and 1½ miles eastward of the largest, is a reef on which the sea generally breaks; in other directions they may be approached with safety.

PORT MALASPINA, separated from Bustamante bay by Gravina peninsula, is a mere rocky inlet, unfit for anything except a boat. Upon this coast a southerly gale drives a heavy sea. The land has everywhere a barren desert appearance, destitute of verdure. In height it is generally between 100 to 700 feet, Pineda paps, about 10 miles inland, being 660 feet high.

CAPE ARISTAZABAL,* about 2½ miles southward of port Malaspina, has deep water close-to, excepting at three-quarters of a mile to the south-east, where there is a reef which causes breakers at half-tide. Off the cape the flood tide sets to the north-eastward about 2 miles an hour; the ebb runs to the southward.

From cape Aristazabal to Cordova cove, a distance of 46 miles to the south-west, the land gradually rises. A range of table land is

* The British S.S. *Brenda* (1893) foundered on a sunken rock reported as lying about 1½ miles East of cape Aristazabal, and as no detailed examination has been made of the vicinity, Mariners are cautioned to give it a wide berth.

seen, increasing in height as it extends southward. There is no known danger between these places, excepting a rock off the Quintano isles, which lie 7½ miles westward of the cape. The soundings are regular, the tides scarcely felt, the coast steep-to, and bold. Southward of Quintano isles, high light-coloured cliffs fringe the shore, and continue as far as Cordova cove.

Salamanca peak, situated about 11 miles northward of Cordova cove, is a regular-shaped cone, about 700 feet high, which shows distinctly above the high ranges of table land, and is visible in clear weather from a distance of 30 miles.*

Cordova cove is rocky and shallow, and almost unfit for any vessel. A reef extends half a mile eastward and southward from the northern point of the cove; and 2 miles north-eastward of the point lies Novales shoal, a small rocky ledge under water. At 5 miles southward of the cove, and one mile off shore, are the Ali rocks, covered at high water, but will be seen by the breakers. There is no other outlying danger between Cordova cove and cape Three Points, the southern point of the gulf of St. George.

TILLI ROAD, 14 miles to the south-west of Cordova cove, lies northward of Marques point, and is tolerably good anchorage during westerly winds. The beach is level and sandy, but so much swell generally breaks upon it that landing is difficult. There is plenty of small firewood near the shore, and a salt-pan of fine white salt. The position of the roadstead may be recognised by its lying between the second and third prominent bluffs, which are seen to the southward of the lower land about Cordova cove. From north, through east to south, the road is open. The anchorage is in 5 or 6 fathoms water, over a clean sandy bottom.

COAST.—In the depth of the gulf of St. George, from Tilli road to a cliffy bluff named cape Murphy, a distance of 35 miles, the shore is low; generally a shingle or sandy beach, without cliffs or rocks. The soundings in the offing are regular. Thence for 28 miles to Casamayor point, the shore is rugged and broken. Very little cliff is seen until Casamayor point is reached, where the land again rises into a high ridge, named Espinosa heights, fronted by precipitous cliffs. Thence to cape Three Points the coast for 48 miles is cliff, rock, sand, or shingle, in disconnected portions.

* *See* view on Admiralty chart, No. 1,288.

CAPE THREE POINTS* (Tres Puntas), in lat. 47° 5′ S., long. 65° 50′ W., may be known from seaward by observing that it is the termination of a long range of table land trending north and south. A short distance south-eastward of the northern end of that range, is a remarkable conical hill, 250 feet high, like a sugar-loaf, attached to the main range, though rather a straggler; and there is a small sharp peak rather northward of the fall of the range. The cape shows three distinct upright heads of a light-coloured earthy cliff; off these heads are ledges of rocks, extending half a mile to seaward, and over them the tide rushes and ripples with violence. One mile from the shore there is no danger.

From cape Three points to cape Blanco, a distance of 8 miles to the south-east, the coast is low, rocky, and fringed with kelp, with table land in-shore. Salt lagoons extend for many miles in-shore of these points.

CAPE BLANCO, at a distance, makes as an island. Three distinct masses of rugged rock, about 130 feet high, are connected to the main land by a narrow low isthmus. On each side of the isthmus is a small cove. That on the south side is sheltered, excepting from south to east. A very small vessel might obtain tolerable shelter from all winds by anchoring close to the end of the kelp, in the north-east corner of the cove.

A vessel intending to anchor here should make great allowance for the tide. The flood sets with force over the bed of rocks which lie half a mile north-eastward of the cape, and they would prove extremely dangerous if drawn among them. The beach around the cove is rather steep, and formed of shingle, here and there mixed with dark sand. The depth is from 4 to 6 fathoms. Plenty of fire-wood may be cut on the south-west side of the cove, a few yards from the beach, but there is no appearance of fresh water.

Byron shoal.—Between capes Three points and Blanco, is Byron shoal, about 6 miles in extent in a north-west and south-east direction, and about a quarter of a mile wide. Over this shoal there is little water in many places, the soundings are irregular, and the locality should be avoided. Ripplings and overfalls more or less violent, according to the time of tide and direction of the wind, point out the position of the bank. The north end of the bank is

* *See* Admiralty chart:—Cape Three points to the strait of Magellan, No. 1,284, scale, $m = 0{\cdot}06$ of an inch.

7 miles E. by N. from cape Three points; and its southern end E. by N. ½ N. 5 miles from cape Blanco.

The north end of Anne shoal bears E. ¼ N., 7 miles from cape Blanco, and extends in nearly a southerly direction for 2 miles. Between these shoals there is a passage 2 miles wide, and the depth gradually increases to more than 15 fathoms.

Within these shoals are two others; a small one with 2 fathoms on it, bearing E. by S. ¾ S., distant 2¼ miles from cape Blanco; and another 2 fathoms bank, which has been named after the cutter *Susannah*. It is 2½ miles long, in a N.N.E. and S.S.W. direction, and nearly a mile broad; and its northern end lies 3½ miles E.S.E. from cape Blanco.

There is probably more shoal ground to the north-eastward, as, with cape Three points bearing S.W. by W., the depth rather suddenly decreases from 40 to 14 fathoms, pebbly bottom, about 10 miles within the 50 fathoms' edge of the bank. On approaching the land, the quality of the bottom becomes irregular, and changing from ooze to sand, with pebbly shoal patches; so that by attention to the soundings and nature of the bottom, these shoals may be avoided.

A good mark to avoid these shoals is, not to approach so near to the cape as to see the rugged hillock of cape Blanco, and to keep the high land of cape Three points, which is visible from the deck about 20 miles, on the horizon.

TIDES.—At full and change, the flood or northerly tide ceases in the offing about 4h. 15m., but near cape Blanco and among the shoals, the tides may be less regular; they produce strong ripplings, and set from 3 to 4 miles an hour round cape Three points.

COAST.—Rivers peak, about 20 miles south of cape Blanco, is isolated, and when bearing West, shows northward of a table-topped range E.S.E. of it, which latter has a fine steep bluff at its southern end. Rivers peak may be seen from a distance of 20 miles in clear weather. The coast line between cape Blanco and port Desire is low and imperfectly known; within the distance of 3 to 5 miles from the shore there are several patches of rock, which uncover at half-tide, but beyond that distance the coast is free from any known danger, and may be approached to not less than 15 fathoms; within that limit the ground is foul. Within 3 miles of port Desire the land becomes high and cliffy.

PORT DESIRE,* at the mouth of the river of the same name, has rather a difficult entrance, from the strength of the tide and its narrow breadth, and it is rendered still more confined from several reefs that extend off the north shore, or that lie nearly in mid-channel. The north point of entrance is a steep bluff, and is therefore remarkable, as being the only point of that description along this part of the coast. Direction hills, 420 feet high, are situated about 4 miles to the north-westward, and show out well, and are easily recognised at some distance.

Sorrell ledge.—At 4 miles N.N.E. from Seal island, eastward of the bluff, is Sorrell ledge, a quarter of a mile seaward of which the depth is 13 fathoms. Tower rock, 1½ miles within the entrance, on the south side of the port, is very conspicuous and becomes visible soon after passing this ledge; it opens out when the North bluff bears about S.W.

Seal island.—This rocky islet, at the north-east point of the entrance, coloured white by guano, shows well against the dark-coloured bluff behind it when seen from the northward. At low water, black rocks extend from Seal island in a south-easterly direction; this is also the best time to enter, when many of the rocks are uncovered.

Chaffers ledge, on the south side of entrance, can usually be distinguished by the breakers upon it. The tidal streams run at the rate of 5 to 6 knots, under-running the kelp, but at low tide the kelp shows near the ledge and may be passed close to.

Beagle rock, near the centre of the channel, is very dangerous, giving no indication of its existence. All other dangers show by the breakers upon them.

Shingle point.—Beacons.—Two pole beacons have been placed upon Shingle point to serve as a leading mark between Chaffers ledge and Beagle rock. The inner beacon is surmounted by a ball, the outer one has a ball one-fourth from the top. These beacons are small and cannot be easily distinguished beyond a distance of 2 miles.

Settlement.—The failure of the water supply has necessitated the removal of the settlement (consisting of a few wooden huts, and a party of 13 men commanded by a Naval officer) to the south shore.

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* *See* Admiralty plan :—Port Desire, on sheet No. 1,309, scale, $m = 1{\cdot}5$ inches.

Shipwrecked crews are assisted here by authority of the Argentine government. The Argentine flag is hoisted when a vessel is sighted; this flag can be seen when Tower rock opens. The ruins of the old Spanish settlement, established in 1829, were in 1883 in a good state of preservation, and are in possession of the present settlers; cabbages, parsley, cherries, and quinces remain in the gardens planted by the early Spanish settlers.

A vessel sailed from the Clyde in 1876, with building materials and mechanics of various trades, for the purpose of establishing a Scotch colony here; but nothing further is known of them.

The inlet was examined, as far as a boat could go, by H.M.S. *Beagle*, and from a neighbouring hill it appeared at that time to be fed by a very small winding stream; but from the broad level ground, and muddy flats on either side of the stream, and the steep cliffs which bounded them, it appears probable that they form the bed of a large river at certain periods of the year.

Supplies.—At 4 miles above the ruins there is a small peninsula, connected by a narrow isthmus to the north shore; by sending a party up, and stationing men with guns on the isthmus, it is very likely that several guanacos may be shot as they are driven across it; for the peninsula is their favourite feeding-place. These animals are abundant, but unless stratagem be used they are very difficult, from their shyness, to be approached. The easiest way of shooting them is by lying in wait, at break of day, near the places where there is fresh water. Guinea pigs are also numerous, and excellent eating; partridges and hares may also be shot.

There are some holes, near the ruins, which generally contain water, but of so brackish a quality as scarcely to be worth notice. On the islets up the inlet, and in many of the valleys, firewood of a superior quality may be obtained. The country appears to be a parched barren desert, with some tufts of brown grass and a few stunted bushes. Of edible vegetables there are few or none; good wild fowl are plentiful, and fish, especially shell fish, are abundant.

Indians.—The Indians in the neighbourhood of port Desire, which formerly were hostile, are now said to be friendly, and come into the settlement for purposes of trade.

Pilots.—A small cutter is stationed at port Desire by the Argentine government, as a revenue and protection vessel in charge of the man

who is the pilot of the port, and who will come off on the usual signal being made.

Anchorage.—A good position is with Tower rock bearing S.E. by S., and shingle point E. ½ N., or more easterly as the vessel's draught will admit. There is anchorage for large vessels, as far as 6 miles up the inlet.

Temporary anchorage will be found in 7 fathoms, well sheltered from westerly winds, with North bluff bearing N.W. ½ W., and Tower rock W. ¾ S. This position being a little to the southward of the fairway of the port, and about 1½ miles from the nearest shore, is out of the strength of the tide. The bottom is strewed with rounded stones, but the holding ground, although of such suspicious quality, seemed to be good.

Tides.—It is high water, full and change, at port Desire at 0h. 10m., springs rise 18½ feet. The tides set in and out of the port with regularity, and at the rate of 5 knots an hour. The interval of slack water is short. It should be borne in mind, when approaching any part of the coast between Union bay and port Desire, that there is a difference of half a tide, or 3 hours nearly, between the turn of the tide-stream in the offing and the time of high water in the harbours. The flood or northerly stream in the offing runs from three hours before high water by the shore, until three hours after high water; the ebb the reverse way.

Directions.—By waiting for low water, all the dangers that exist will be seen, and a sailing vessel may be dropped in with the tide, should the wind be, as it generally is, westerly. If it be fair it will be advisable for the vessel to be in the entrance at slack ebb, or a little before; as the water is deep on the south shore, there seems to be no real danger that may not be avoided by a careful look-out for kelp, which on that coast always grows upon, and therefore plainly indicates the existence of rocky ground. It must be remembered that the chart is old and little more than a sketch.

When approaching from the northward, vessels should give Seal island a berth of not less than one mile, steering for the white cliffs in the bight southward of Chaffers point; and when the triangular patch on the distant hills is in line with Shingle point bearing W. ½ S., steer for them on that bearing, until the beacons on Shingle point are seen; keeping them in line bearing S. 86° W., leads between Chaffers ledge and Beagle rock in not less than 5½ fathoms at low water.

When Seal island bears N.E. ¾ N., the vessel will be abreast of Beagle rock and past Chaffers ledge, borrow towards the south shore which is steep-to, but between Shingle point and the settlement shore where the stream is very strong, it is recommended to keep in mid-channel. When past Shingle point, sheer over to the north shore out of the strength of the tide, and anchor off the ruins of the old settlement.

SEA BEAR BAY.*—Penguin island, situated off the north-east point of Sea Bear bay, is 11 miles south-east of port Desire. It is about 150 feet high, is bold on the eastern side, and may be passed close to, for the tide rather sets off than towards the shore. There are a few huts on the island, apparently deserted, though probably used in the sealing season. South-west of this island is Sea Bear bay, one of the best anchorages on the coast, but difficult of access without a leading fresh wind, on account of the spring tides, which set through the narrow channels between Penguin and the coast; and though an anchor might save a vessel from driving ashore, the bottom is very foul, and she would not be likely to recover it.

In entering the bay, border pretty close to Wells point, the low rocky south point of entrance, in order to avoid May reef, which lies about a quarter of a mile North from the point; but as the reef always breaks, the eye and a due consideration of the tides are the best guides. The reef extends for some distance eastward of the breakers. Within the reef the tide sets in or out of the bay, but with little strength. There are depths of 12 or 13 fathoms off the reef; then the water shoals for one or two casts of the lead, to 7 fathoms, after which it deepens again. The vessel may then haul across the bay, and anchor in 4 fathoms, with Wells point bearing East, distant about a quarter of a mile; avoiding the kelp which projects from the sandy beaches. For further directions the plan will be the best guide. When once in, the anchorage is good, and protected at all points, except between N.E. and E. by N., but from the appearances of the beaches it is not probable that a heavy sea is often thrown in.

Should a vessel not be able to enter the bay, there is anchorage off Wells point between it and the reef, on (it is said) tolerably clean ground.

Supplies.—There is no wood of any size to be procured in Sea

* *See* Admiralty plan :—Sea Bear bay on sheet, No. 1,309, scale, $m = 0 \cdot 4$ of an inch.

Bear bay, and the few gallons of water that may be collected in the wells, situated immediately within Wells point, are too precarious to be worth attention. The passage to these wells is over a small rocky bar, which a boat may cross at three-quarters flood. There is a small spring at the north end of the third sandy beach, which a herd of guanacos was observed to visit every morning, but as the water only trickles down in a very small quantity, it can afford only a temporary supply. In short, besides a secure anchorage, this place affords no advantage, though convenient for sealing vessels to anchor in, while employed in their occupation upon Penguin island.

Tides.—It is high water, full and change, in Sea Bear bay at 0h. 45m., rise 20 feet. The tide off the entrance is very rapid, and forms, even in a calm, strong ripplings, which in a breeze must be very dangerous for boats to pass through, and indeed, not agreeable for vessels of any size. The flood sets to the N.N.E., and has been observed as much as 3 knots against a strong northerly wind. The ebb sets nearly in the opposite direction and about the same rate. Off Penguin island the northerly stream ceases at about 4 hours after high water by the shore.

SPIRING BAY lies between the south head of Sea Bear bay and Shag rock, which lies off Hilly point, 10 miles to the southward. It forms a deep bight, but is quite open to the south and east, and after a south-west gale, when the wind always veers to South and S. by E. there is a considerable sea. The shore is skirted by rocks some distance off, and the bay is quite unfit for anchorage. The land is of the same height as about Sea Bear bay, but has more lumps of rocky hills visible on the outline of its summit.

Shag rock is a whitish mass of bare rock, lying about 1½ miles off Hilly point. At 2 miles to the southward of it are four small dark-coloured rocks; and a mile farther, rather a large rocky islet.

The highest and most conspicuous hill in Spiring bay is that situated 7 miles north-west of Hilly point. It shows as a good mark in all directions.

Vigia.—Off Spiring bay, a rock named the Eddystone (Sirius shoal), was shown on the old charts. It would seem that this rock and the Bellaco rock, mentioned hereafter, are the same danger; but the whole coast between cape Blanco and port San Julian is much

strewed with shoals, which are the more dangerous from the strong tides setting between them.*

In directing the ship's course by night near this coast, regard should be paid to the tidal streams, which set with considerable strength, parallel with the shore; as a general rule, when the depth is more than 40 fathoms, there exists no known danger.

DESVELOS BAY.—At the distance of 22 miles to the southwest of Shag rock, is a low point named cape Watchman, the southern extremity of Desvelos bay. At 6 miles northward of the cape about one mile off shore is a shoal of 3 fathoms, with kelp on it. There are also many other shoal patches, usually marked by seaweed, with 7 to 9 fathoms between them.

The ground is foul and uneven for about 5 miles off cape Watchman, causing heavy tide rips. It is advisable to give the cape a wide berth and pass eastward of Bellaco rock. Northward of the cape, a hill named Monte Video will be seen, somewhat resembling El Cerro at Monte Video, both in shape and colour, but not quite so high.

Desvelos bay offers good shelter from westerly winds; but due allowance must be made for the tides, which sweep along the shore from 2 to 3 miles an hour.

Bellaco rocks, situated S.E. by E. distant 10½ miles from cape Watchman, consist of two rocks awash at high water, with kelp growing on most parts. The larger or eastern rock is about 100 yards long and 80 yards across.† Within half a mile of the south side of these rocks there are depths of 12 to 15 fathoms, rocky bottom; and on the east side, at the same distance, from 20 to 24 fathoms. Bellaco rocks at low water would be seen in clear weather from some distance, as there is a rise and fall of 20 feet.

LOOK-OUT POINT.—Foul ground.—From 4 miles southward of cape Watchman, to Look-out point, the land increases in height and the coast is safer; but 5 miles eastward of that point there is a large patch of foul ground with much kelp. The land still rises, in advancing to the southward, till it attains the height of above 600 feet, and is then remarkable for its horizontal outline.

* *See* voyage of *Adventure* and *Beagle*, vol. ii., 1834.

† The ship *Sirius* is said to have run on a reef of rocks about 10 miles E.N.E. from the southern point of Spiring bay. The position of the reef was given as about lat. 4° 7′ S., long. 65° 37′ W. *See also* Nautical Magazine for August, 1849, page 433.

Flat and Bird islets, 11 miles to the southward of Look-out point, though low, are too near the land to be dangerous to vessels that keep a fair offing.

Dañoso reef.—At 9 miles to the southward of Flat islet, and off the high table land of cape Dañoso, a dangerous reef projects 3 miles to the south-eastward from the shore, but it does not appear to be steep-to. From thence to port San Julian there is no known danger.

PORT SAN JULIAN* is situated S.S.W. ½ W. distant 75 miles from cape Watchman. Mount Wood, 951 feet high, and visible from about 35 miles, is a good mark for this port, being flat-topped and much more elevated than the land about it. The trend of the coast may also be useful as a mark; and the land about the port being higher than that on either side of it, no mistake can be made. Cape Curioso, the north point of entrance, is a low point jutting northward, formed of stratified cliffs, of which the upper part is white brown, and the lower black, or with black streaks.

A bar crosses the entrance, and forms in the middle an extensive bank just covered at high water, leaving a rather intricate channel on either side. The great range of tide makes the passing this bar comparatively easy, by previously observing the position of the banks at low water; but great attention should be paid to the set of the tides, which run sometimes at the rate of 4 miles an hour.

Desengaño point, on the south side of entrance, may be distinguished 6 or 7 miles off in clear weather. A spit extends about three-quarters of a mile in a N. by E. direction from the point.

Supplies.—No fresh water was found in any part of this inlet, its upper division being a chain of salt lagoons; but wood may be procured on Shag island, and at other places. Seafowl and fish are plentiful.

Tides.—It is high water, full and change, at port San Julian at 10h. 45m.; springs rise 30 feet; neaps 23 feet; and neaps range 16 feet.

Directions.—At about three-quarters flood is the best time for entering, as a vessel will probably then have depth enough on the

* *See* Admiralty plan:—Port San Julian, No. 1,292, scale, m = 1·5 inches. The southern channel seemed the most intricate, and several small patches were seen in it. In the north channel, in the track taken, 19 feet at high water, was the least depth obtained.—Remark Book, Navigating Officer, H.M.S. *Rocket*, 1875.

bar, and the parts that dry at low water will still be visible. The most convenient anchorage is off Sholl point in 4 fathoms. The little monument erected by his shipmates to the memory of Lieutenant Sholl is close to this point.* If the tide do not serve for going in, anchor in 8 or 9 fathoms a good mile N.E. of Desengaño point till a proper opportunity offers. But if the wind be S.E., or the weather threatening, stand off and on.

The COAST to the southward of port San Julian is low, covered by scrubby bushes, and fronted by a shingle beach. At 10 or 12 miles south of the port, a small flat hill is seen over the low coast hills.

In latitude about 49° 29′ S., the character of the coast changes to a range of steep white clay cliffs, the average height of which is about 315 feet. They rise like a wall from the sea, which, at high water, nearly washes their base; but at low tide they are fronted by a considerable extent of beach of shingle and mud. Some short rocky ledges, which break at half tide, lie off several parts of this range, but none of them extend more than a mile from the shore.

Anchorages along the coast may be taken up with the wind off shore, at one to 2 miles from the beach, and in 9 to 14 fathoms oozy bottom. In latitude 49° 58′ S., the range of steep white cliffs begins gradually to diminish in height, and terminates at 9 miles farther to the southward, in North point, 180 feet high, forming the northern side of the entrance of Santa Cruz river.

RIVER SANTA CRUZ.—The estuary of this name, about 16 miles in length, in a north-west and south-east direction, is formed by the junction of the rivers Santa Cruz and the Chico. At the entrance it is about one mile in breadth, increasing to 3 or 4 miles inside.

Santa Cruz is of importance from the fact of its being the only place on the east coast of Patagonia where large vessels can enter. Light craft can navigate to Pavon (Pabon) isle, 15 miles above Weddell bluff, but the channels are intricate.

The appearance of the coast about the entrance of this river is remarkable, and easily recognised. From the southward a coast line of cliffs and downs of considerable height is seen extending from the southward, as far as the eye can reach, and terminating abruptly

* In existence in 1890. Cruise of *La Argentina*.

in the high, steep, flat-topped cliff, mount Entrance (Argentine), 356 feet high, and the south point of the river; the land on the northern side of the river is low.

At 12 miles up the river, on the south bank, is Weddell bluff, a conspicuous headland 300 feet high; and 6 miles farther, on the opposite shore, is another named Beagle bluff.*

Northern Arm.—At Weddell bluff the river divides into two arms; the northern one, which passes under the east fall of Beagle bluff, was examined by Captain Stokes for 12 miles above its commencement, where it ceases to be navigable, even at high water. Its bed was divided by banks of sand into several little fordable streams, preserving, as far as the inequalities of the land would permit the eye to follow their course, a mean N.W. by N. direction. The stream at this part was quite fresh, but still subject to the regular ebb and flow.

The shore on the south-west side of this arm, is a range of clay cliffs, of the average height of 250 feet with grassy downs, intersected with valleys and ravines. On the eastern side the land, for the most part, is low and level, with a shingle beach; the aspect of the country is dreary, and the vegetation scanty. Many brant geese and ducks were seen, as well as the common sea fowl of these parts; several ostriches also made their appearance on the beach, and traces of guanacos were observed.

Western Arm, which is far the more considerable of the two, was examined for 33 miles. From Beagle bluff it trends W.S.W. 6 miles, with a mean breadth of 2½ miles. At 4½ miles up, the influence of the tides had altogether ceased, and the water was quite fresh. The stream ran clean and pure, with the velocity of at least 5 miles an hour, over a bed of pebbles mixed with dark sand, its mean breadth being three-quarters of a mile, and depth in mid-channel 8 feet. It runs between two nearly parallel ranges of hills, about 4 miles asunder; beyond this the reaches are short, seldom more than 2 miles long, and forming tortuous courses.†

Captain Fitz-Roy undertook an expedition up the river, with three light whale-boats; they laboured by rowing or tracking, for 16 days, when their provisions falling short, they were obliged to abandon this interesting exploration and to return to the ship, which occupied

* *See* Admiralty plan:—Port Santa Cruz, No. 1,308, scale, *m* = 0·5 inch.

† From the late Commander Stokes' MS. Journal.

but four days. The utmost point they reached was 140 miles in direct line to the westward of the entrance, or 245 by the course of the river; and they were then within 30 miles of the foot of the snow-capped Andes.*

Settlement.—At half a mile below Weddell bluff is the settlement, composed of a small party of seamen under the charge of an officer, stationed here by the Argentine government, and who afford shelter and food to shipwrecked seamen.

Supplies.—Guanacos are plentiful and good eating, and the flocks and herds are rapidly increasing in the interior. Fresh water may be procured at the watering place at the settlement; above Weddell bluff, the water is fresh the last half of the ebb. Firewood is obtainable.

A colonist is living with his family on Pavon isle, 15 miles above the settlement, and there are a few dwellings between.

Bar.—From 4 to 5 miles seaward of the entrance points is the bar, which stretches in a southerly direction from the north shore, a distance of about 7 miles. This bar is an accumulation of mud and gravel, with shoal patches in places, some of which dry at low water about 6 feet, and others are denoted by breakers.

The bar was examined by the French government vessel *Volage* in 1882, and was found to have considerably altered since the survey of 1834; though three channels, as formerly, with depths of from 2 to 3 fathoms at low water, still exist, though in different positions.

Volage bank, which breaks at low water, lies nearly 2 miles outside the bar, with mount Entrance bearing N.W. by W. ½ W., distance $5\frac{8}{10}$ miles.

Beacons.—A white beacon is placed on the spit extending off Entrance point, and is used as a mark for the North pass. Two beacons are erected eastward of Shingle point, and mark the West pass.

Anchorage.—There is good anchorage on the south-west side of Sea Lion island, in about 3½ or 4 fathoms, out of the strength of the tide.

A good berth will also be found above Sea Lion island, and near the shore under Weddell bluff; but strangers should first anchor in

* Fitz-Roy's Voyages of H.M.S. *Adventure* and *Beagle*.

the bight near Keel point, so that another ebb may expose to view the shoals that surround that island. The sloping shingle beach at Keel point, on the south shore, 3 miles within the entrance, where the *Beagle* was placed on the shore in 1834, offers a most convenient spot for beaching; and the great rise of tide (which must be considered when anchoring), and clean shore, renders port Santa Cruz a most desirable place for that operation. It is advisable to moor. Violent squalls, but of short duration, have been experienced in the month of December.

With a fresh breeze blowing against the strong currents in the river, the navigation is somewhat dangerous for boats.

Tides.—It is high water, full and change, in the river Santa Cruz, at 9h. 30m.; springs rise 40 feet, neaps rise 29 feet, with a velocity of from 3 to 6 miles an hour. In the offing the tides flow regularly 6 hours each way, but turn 2 hours later than the time of high water in-shore. The flood runs to the north-eastward, and the ebb to the south-westward.

Directions.—North pass.—This pass, between the north shore and the dry banks of the bar, is considered both the safest and easiest.

Mount Argentine (Entrance) may be approached bearing about W. by S. ¾ S. until the white beacon on the spit extending from Entrance point is seen; when it must be brought in line with the dark coloured V-shaped notch in the white cliff westward of mount Entrance, and which will lead over the bar in the best channel. When Weddell bluff is in line with Shingle point, the bar is crossed, and vessels may steer as necessary for the anchorage.

Central pass.—This pass was the one formerly recommended, but it has now changed in position and become narrower.

To enter the river by this pass, the bar should be crossed with Weddell bluff seen midway between Entrance and Shingle points, bearing N.W. by W. ⅝ W.

West pass.—Was used by the *Volage* when leaving the port, but it is not recommended to be used when entering, as the turn is very sharp into the river.

Two white beacons situated eastward of Shingle point, kept in line, is the leading mark for this channel.

After passing the bar, which is about a mile broad, there is no

impediment to a free course up the river, keeping midway between the narrow points of entrance, until reaching the shoals which project off the east point of Sea Lion island.

Caution.—Where tides are rapid, and a heavy sea frequent, it is not probable that a bar of sand and shingle stretching across the mouth of a large river should long retain its position. Strangers are therefore advised to remain outside the bar, either at anchor in about 8 fathoms, or under sail, till low water, when its shallow parts will show themselves; and then, as the tide rises very high, to weigh at half or two-thirds flood, and steer directly in through the most convenient of the channels.

COAST.—Between Santa Cruz and Coy inlet, a distance of 58 miles to the southward, the coast forms a considerable bight, and consists of a succession of cliffs and low beaches. It is fronted by a ledge of rocks, which are either dry at half tide, or are then shown by a line of breakers; they extend in some places a distance of 3 miles from the shore. This coast should not be approached within 5 miles; it affords neither fuel nor water.

From Coy inlet to cape Fairweather the coast is similar to that northward of the inlet, but more free from rocky ledges, and good anchorage may be had from 2 to 6 miles off-shore, in from 7 to 14 fathoms mud, the water shoaling gradually to the shore. The beach is of shingle to high-water mark, and then of hard clay to just beyond the low-water limit, where a green muddy bottom commences. The outer edge of the clay is bounded by a ledge of rocks, on which the sea breaks, and which extends for some distance parallel with the coast.

COY INLET is conspicuous, as it is the only part of the coast that has the appearance of an inlet between Santa Cruz and cape Fairweather.

It is said to be a shoal basin 19 miles in length, of some miles in breadth at high water, and fronted by a bar of rocks, with a passage of 6 feet water; inside, there are places with from one to 3 fathoms, but in most parts of the inlet the banks are dry at low tide. The southern side of the inlet is cliffy, and at its head receives the drains of an extensive flat country.

Tides.—It is high water, full and change, in Coy inlet at about 9h. 30m., and the tide rises 40 feet.

CAPE FAIRWEATHER is the southern extremity of the long range of clay cliffs, 300 to 400 feet high, that extend from Coy inlet. The interior is formed by open plains of undulating country, covered with grass and plants, but entirely destitute of trees: it abounds with guanacos. The cape, from a distance, with the low land to the southward below the horizon, has been mistaken for cape Virgins and the strait of Magellan, notwithstanding that there are more than 45 miles difference in the latitude of the two headlands. In fine weather, the Friars and other hills will assist in identifying the coast; in thick weather, the bottom will be of service, that off cape Fairweather being mud, whilst off cape Virgins it is gravel and coarse sand.

Water.—About 17 miles north of cape Fairweather there is a ravine where water may be obtained when the wind is off shore; it is much grown over with plants, and may not keep, but for a temporary supply it seemed good. Besides this fresh water may be seen trickling down the face of the cliffs at short intervals.

PORT GALLEGOS.*—The entrance of this port is formed on the north side by the cliffy land of cape Fairweather, and on the south by a low shore that is not visible at sea for more than 10 or 15 miles, excepting the hills in the interior named the Friars, the Convents, and North hill. It is fronted by extensive sand-banks, which extend about 7 miles off shore, most of which may be crossed at high water, but at half-ebb many are dry; others never dry, but are easily distinguished by the breakers upon them. The entrance is southward and westward of these banks, and parallel with the shore south of Loyala point. There is a settlement on the south bank of Gallegos river, 10 miles from its mouth, consisting of about a dozen houses. From this settlement there is an easy track to Sandy point in Magellan strait, available for wheeled vehicles. The journey occupies about three days. The climate is dry and invigorating. The settlers are engaged in raising cattle and sheep.

Anchorages.—A vessel should anchor about 1½ miles off shore, with cape Fairweather about N.W. by N., and observe the channel and banks at low water, before proceeding in. This anchorage is good, and sheltered from the prevailing winds.

Anchorage inside may be taken up on the south side, near Loyala point; to the northward the banks are extensive.

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* *See* Admiralty plan:—Port Gallegos, on sheet No. 1,309, scale, $m = 0{\cdot}4$ of an inch.

Caution.—The banks at the entrance of this port have changed considerably since the survey made by Captain Stokes in 1828; H.M.S. *Nassau* in 1867 grounded in 8 feet at low water, close to where 10 fathoms was marked in the chart. As, however, there is a rise and fall of tide of 46 feet at springs, a vessel of moderate draught can always enter at half tide by keeping close round the southern point. No large vessel should attempt to go inside.

Directions.*—Approaching port Gallegos, the North Convent should be kept in line with South Friars until the south extreme of cape Fairweather bears N.W. ½ N. then steer for it, and round Loyala point at a distance of about 2 cables. When clear of the western part of this point, the houses of the settlement on the south shore may be steered for until the leading marks are seen over a square white house at the west end of the settlement. The outer mark consists of a pole with triangle, and the inner mark a pole with cage. These marks in line lead to the best anchorage in not less than 4 fathoms, loose shingle, between the pier and an extensive shoal in the middle of the river. Care is necessary to avoid this shoal as it dries about three-quarters ebb. Vessels should be prepared for dragging as the holding ground at this anchorage is bad. H.M.S. *Basilisk* moored on the north side of the shoal during neaps, but at springs there would not be sufficient water. Half flood is the best time for entering and leaving port Gallegos.†

Tides.—It is high water, full and change, in the entrance of port Gallegos at 8h. 50m.; springs rise 46 feet, the stream runs at the rate of 5 miles an hour.

The COAST from port Gallegos towards cape Virgins trends south-eastward, and, for the first half of the distance, is formed by a low shelving shore, which at a few leagues at sea is not visible.

At 18 miles to the southward of cape Fairweather the cliffs again commence, and continue to cape Virgins, with only one or two breaks, in one of which, 8 miles north of the latter cape, a boat might land, if necessary. There is good anchorage along the whole coast between port Gallegos and cape Virgins, at 2 to 5 miles from the shore; but the bottom is rather stony.

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* These directions do not refer to the old survey. A new survey is in progress by the Argentine government (1892).

† Lieutenant A. H. Ozzard (N), H.M.S. *Basilisk*, 1892.

CAPE VIRGINS, the northern entrance point of Magellan strait, is 135 feet high, and when approaching the strait from the eastward is the best point to make, and usually the first land seen. In clear weather the cape is visible from 20 to 25 miles, and when made from the northward, between the bearings of S.S.E and W.S.W. it will appear as an extreme of land; Dungeness spit with its beacon will not be visible until much nearer. When cape Virgins bears westward of W. by S., mount Dinero will show as a small nipple, opening clear of it.

Cape Virgins and cape Espiritu Santo have certain points of resemblance, for both are marked with white cliffs forming the seaward termination of a range of hills of moderate height, extending into the interior; and both capes have low shingle points connected with them.

It may be observed that the most remarkable difference takes place in the appearance of the land according to the light in which it is seen.*

LIGHT.—*Proposed.*

WINDS and WEATHER.—On this coast, between the parallels of 40° and 50°, much uniformity of weather prevails, those ten degrees of latitude causing less variation of temperature than could reasonably be supposed. The winds are also more regular than those about La Plata, and as the quanity of rain which falls during the year is beyond comparison less, the climate is at least as warm as that of Buenos Aires, and so very dry that the land is generally parched and sterile, except near rivers. In some ports on this coast, San Blas, the Oven, San Antonio, and others, it is ruinous for a ship to lie moored during many summer months; even weeks of delay are injurious, so powerful is the effect of the sun, rarely clouded, and acting throughout the whole day upon the woodwork, unmoistened even by dew.

In winter there are sometimes sharp frosts at night, but they do not continue through the day. Snow is rarely seen: hail with southerly winds is common and very large. During the summer months, while the air is in a settled state, the wind generally backs round the compass during the twenty-four hours, a moderately fresh sea-breeze from the south-east in the afternoon being succeeded by a land wind of similar strength from the north-west during the night; light winds or calms prevail in the mornings and evenings.

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* *See also* Caution in making Cape Virgins, on p. 36.

In settled weather, the wind always goes round with the sun from east to west by the north: when it takes the opposite direction, bad weather usually follows. Gales from the south-east occur once or twice in a month, and generally, it is said, about the full or change of the moon. In summer, or from November to May, these gales are heavy, and are very much felt on the coast, as they send a heavy sea into the harbours, and are sometimes accompanied by rain and thick weather. Other strong winds blow chiefly from the land, and bring clear pleasant weather; north-east winds sometimes bring rain, but they rarely, if ever, increase to the strength of a gale. During the winter season, or from May to November, southerly winds are more frequent, and last longer than in summer; more rain is brought at that time by winds from N.E. and S.E., but the latter wind is not usually so strong as in summer.

On this part of the coast, as well as in La Plata and about Tierra del Fuego, bad weather with northerly winds will continue until the wind shifts to the southward, going round by the west. Squalls or gales of more or less strength from S.W. to S.S.E. soon clear the air, and the louder and longer the southerly wind blows, the finer and more lasting will the weather be afterwards. These southerly winds are dry, cold, and elastic; they cause the mercury in a barometer to rise unusually high, and have very beneficial effects upon the human frame.

With northerly and westerly winds there is at times much lightning and thunder, particularly during the warm weather. Winds from the northward begin and increase gradually; those from the southward are sudden, and at times they are instantaneously violent. Vessels should be always ready for a sudden shift to the southward when the barometer is low, with a northerly wind blowing, and the weather threatening.

Westerly winds are the most prevalent throughout the year, and they generally bring clear fine weather. Gales of wind sometimes begin blowing from the north-east while the mercury in the barometer is high; if moderate at first, the wind generally increases and draws to the northward as the mercury falls, until it reaches north and N.W., when it blows hardest. Having continued to blow for 12 or 24 hours it moderates, perhaps falls entirely, particularly if there be rain, and in a few hours afterwards shifts to the southward, quickly increasing to a gale, which will be strong in proportion to that which preceded it; or perhaps it may shift suddenly in a squall to the southward, and blow with violence.

The rising of the mercury always precedes, by an interval more or less short, this change from a northerly to a southerly wind. Northerly gales are preceded by gloomy overcast weather, by numerous small clouds apparently very high in the air (cumulo-strati and cirro-cumuli) sometimes by a mistiness or a thick haze, and sometimes by much lightning. Southerly gales may be foretold by large masses of heavy clouds, with hard defined edges (cumuli), rising in the southern horizon.

Barometer.—Very thick gloomy weather, with northerly winds, and perhaps rain, with lightning and thunder, is sure to end in a sudden shift to the southward. If the mercury be low—that is to say, about 29·60 in a barometer averaging 30 inches in settled weather—a gale may be expected. After falling, the mercury will rise shortly before the wind shifts, and therefore the time when the mercury ceases to fall and begins to rise should be carefully noticed. The mercury rises higher with south-east than with south-west winds. Northerly winds cause the mercury to fall: it falls most with the wind at N.N.W. and rises most with winds from the south-east.

During settled clear weather a south-east wind will raise the mercury to near 30·50 inches. With weather equally settled, and apparently equally clear, a north-west wind will depress it to 29·80.

Fogs.—With moderate north-westerly winds, dense fogs have been experienced from February to October inclusive, between lat. 46° S., long. 60° W., and lat. 38° S., long. 52° W., on each occasion the fog cleared when the wind shifted to the southward of West. Fogs occur during the winter months, but they are neither frequent nor are they of long duration.

Squalls are less numerous, and give more warning than in most other parts of the world, but when they do rise they are not to be trifled with. Those from the southward sometimes require nearly all sail to be taken in; and if the barometer has been very low, and the clouds look very heavy, and you cannot see underneath them, it will be prudent to furl almost every sail, and even to run before the first heavy blast, which seldom lasts many minutes. If attention be not paid to this advice, dearly-purchased experience will soon teach the propriety of this cautious prudence, and especially to those who navigate small vessels in this climate.

CURRENTS.—When more than 50 miles from the coast of Patagonia, very little current is found during settled weather and moderate

winds: what there is sets sometimes north, and at other times south, about half a mile an hour; but before strong winds, and while they are blowing, the current runs a mile, or perhaps 2 miles, in the same direction as the wind. Generally speaking, the southerly currents have more strength, and run longer than the northerly: they are, however, very irregular. Nearer than 50 miles from the land, the current sets more strongly from 2 to 3 miles an hour, particularly near the projecting headlands. When nearer than 20 miles to the shore, the influence of the tides begins to be felt, especially if to the southward of cape Corrientes.

TIDAL STREAMS.—Along that dreary and almost unbroken coast, extending from cape Corrientes to Bahia Blanca, the stream of the tide is very weak, although the water rises and falls about 10 feet. The great tidal wave from the southward here appears to end, after sweeping along the southern half of South America. In the archipelago of Tierra del Fuego the flood-tide comes from the N.W., passes round cape Horn, and through the straight of Le Maire, and then, from cape St. John, sets strongly to the eastward and north-eastward. From thence the flood runs to the north-east, along the north side of Staten island and Tierra del Fuego, occasions very high tides at the entrance of Magellan strait, where it unites with the stream which has come directly through the strait, and passing onward along the coast of Patagonia, produces high water at each place in succession until it is lost near cape Corrientes.

Near the coast between the dangerous banks of San Blas and Bahia Blanca, the flood and ebb streams set nearly north and south, from one to 4 miles an hour, according to the wind and the age of the moon. Between the banks of San Blas and the Rio Negro, the tides are regular, running a little more than six hours each way, if not affected by the wind, with a velocity of 2 to 5 miles an hour; these strong and dangerous tides are not much felt at the distance of 15 miles from the land. Between San Blas and cape Bermeja the tidal stream sets N.E. and S.W., about equally strong each way.

In the depth of the gulf of San Matais there is very little stream of tide, but a rise and fall of from 20 to 30 feet.

In the gulf of St. George there is not much stream of tide. Off capes Dos Bahias and Blanco, particularly the latter, the tides are again strong, and there are races off cape Blanco almost as dangerous as those off the peninsula of San Josef.

In navigating this coast the mariner should bear in mind that there is a difference generally of half a tide between the turn of the tides in the offing, and of high or low water in the harbours and along the shore; the turn of the a stream in the offing being three hours later than the corresponding turn of the tide in-shore. In other words, the northern or flood stream in the offing, runs three hours after the tide has begun to ebb on the shore; and the converse.

TIDAL RACES.—Off the peninsula of San Josef there are dangerous tidal races; and so high and so violent are the waves at particular times of tide that a small vessel might be most seriously injured if not totally destroyed by getting into them. Lieutenants Wickham and Stokes, R.N., while surveying this part of the coast in two small crafts, one of 9 and the other of 13 tons burthen, were drawn during a calm within a mile of one of these races while it was roaring and boiling furiously. No anchorage could be had, for no bottom could be found with the deep-sea lead, and they were fast approaching the fatal race when a breeze fortunately sprung up which enabled them to stem the stream, and after a struggle with oars and sails, at last to overcome the tide and avoid the danger.

Near the entrance of the bay of San Josef, there are violent races at times, but not equal in effect to those at the east side of the peninsula.

CHAPTER X.

THE FALKLAND ISLANDS.—EAST FALKLAND.

Variation in 1893.

Berkeley sound -	12° 30′ E.	Choiseul sound -	12° 50′ E.
Stanley harbour -	12° 30′ E.	Eagle passage -	13° 40′ E.

MAKING the LAND.—Vessels approaching the Falkland islands from the northward should endeavour to obtain soundings off cape Corrientes, in about latitude 39° S., when the longitude could be verified; for the edge of the bank is so steep that in a distance of 10 miles the depth changes from 100 fathoms no bottom, to 60 fathoms sand; and by sounding every 2 or 3 miles, until on the edge of the bank in about 80 or 90 fathoms, the longitude may be obtained within a very few miles. In the parallel of 30° S. the edge of the bank is in longitude 55° 45′ W.; in lat. 41°, in about long. 56° 55′; and in lat. 45° in about long. 60°.*

Should a vessel be unable to get in with the coast so as to strike the edge of the bank as far north as latitude 39° S., she should endeavour to do so as soon afterwards as possible; taking advantage of every northerly and N.W. wind to steer about S.W., in order to make up for what she is certain to be driven to the south-east when the wind draws to the S.W., which it does at least every second or third day. By persevering in getting to the south-west, whenever the wind will allow it, until to the westward of longitude 60° W., there will be no fear of being driven to the north-east of the islands; whereas, if a vessel make a straight course for the islands when the wind is fair, she will be almost certain of being driven to leeward by the frequent south-westerly winds, and find great difficulty in getting to windward again. Having, if possible, kept as far to the westward as longitude 60° W., until in latitude 49° 30′ S., soundings will be obtained on the bank to the northward of the Falklands, in about 80 to 85 fathoms, fine dark sand.† If the longitude can be depended on,

* *See* Admiralty chart:—South Atlantic ocean No., 2,203; scale, $d = 0{\cdot}4$ of an inch.

† A rock was reported by the *Eagle* in 1817, in lat. 51° 51′ S., long. 64° 30′ W.; this position was examined by *Fitzroy*, and others, without finding any trace of its existence; and it has been considered that floating ice with *débris* had been seen. The French vessel *Courier du Pacifique* (1884) reports a rock in lat. 52° 10′ S., long. 64° 37′ W., which is also considered to be floating ice. Care should be exercised when in this locality.

a course may then be steered to make the land about 20 miles to the westward of Volunteer point, entrance to Berkeley sound; but if the position of the vessel be doubtful, or the wind draw round from the north-west towards the south-west, it would be better to keep to windward, so as to make the Eddystone rock.*

This rock can be seen in the darkest night if the horizon be clear, before a ship would be in danger, as there is deep water close round it; but if the longitude be uncertain, it would be better, in the night, not to run on, after shoaling to 50 fathoms, should the wind be towards the shore, as a vessel might pass the Eddystone, and become embayed in the deep bight to the westward of it.

The same rule should apply in thick weather, which is always the case with northerly and north-east winds; but if a vessel have had observations shortly before, and can depend on her position, she may run for the north-east point of the island in any weather; and if the land be not seen about Macbride head, or cape Carysfort, when the water shoals to 40 fathoms her head should be put off shore until daylight, or until a break in the thick weather enables the land to be seen: but the days of thick weather are very few, and it is not often that the land cannot be seen when 20 miles off.

In coming from the northward, the most eastern hills seen are those immediately over Berkeley sound. The first appearance of the land is very unfavourable; rugged hills, the summits of which are stony and very light-coloured, have made many suppose that the high land is always covered with snow; but this is rarely the case from October till April or May, except patches in the hollows of the mountains, which sometimes remain till November.

There is a current setting to the north-east, probably part of the cape Horn drift, which has been found 500 miles from these islands, sea-weed, driftwood, and a rippling of the water strongly marking its existence.

Off the Falklands, penguins may be seen and heard 300 miles from the land; they need not, therefore, cause any alarm; one sign, however, is well worth noting, viz.: that of the diver bird or shag, which is rarely seen more than 10 miles off the land.

Caution.—During and after long-continued south-easterly gales, when a heavy sea is rolling in on the S. and S.E. coasts of the Falkland islands, there is stated to be a strong set to the north-westward, to which set has been attributed the loss of several vessels in the neighbourhood of Bull point. Vessels from cape Horn, therefore, intending to sight Beauchêne island, should make due allowance against a possible set of 20 to 30 miles a day to the north-westward.

* *See* Admiralty chart:—Falkland islands, No. 1,354 *b*; scale, m = 0·32 of an inch.

EAST FALKLAND ISLAND.

CAPE DOLPHIN is a long, low, narrow strip of land jutting out from the north-west part of East Falkland; there is a shoal about three-quarters of a mile to the south-west of it, marked by kelp. With northerly winds, a heavy sea prevails all along the coast, from cape Carysfort to cape Dolphin; and between the latter cape and the Eddystone there runs a turbulent race, which would often be fatal to very small vessels.

EDDYSTONE ROCK, lying N.W. by W. distant 4 miles from cape Dolphin, is 260 feet high, and from a distance of about 8 miles resembles a ship under sail. It is steep-to in all directions.

CAPE BOUGAINVILLE bears E. ⅓ N., 20 miles from cape Dolphin; between them the coast slightly indents, and an indraught was observed. The depth of water at a distance of 4 miles is from 40 to 45 fathoms (a fine greenish-coloured sand, with small black specks), gradually decreasing to 12 fathoms close to the shore. At 4 miles westward of cape Bougainville is Lion point, westward of which a cluster of rocks extends a distance of 1½ miles, with 10 fathoms water at one cable to the northward.

PORT SALVADOR, lying 9 miles eastward of cape Bougainville, is a magnificent and spacious port, but difficult to enter, on account of its narrow channel, as well as from the rapidity of the tides, which sweep the kelp under water, and cause in many parts of the channel a violent race; moreover, the water is deep and the bottom hard, consequently it is doubtful whether an anchor would hold, if found necessary to let one go. The extent of the narrow passage to the port is 7 miles, between Hut and Platt points; it is more difficult to enter than to quit, as the wind generally blows outwards, and it is absolutely necessary for a sailing vessel to have, on entering this port, a good commanding breeze.

Caution should be used when passing the entrance of port Salvador, as the tide rushes in strongly; and the reefs on either side, which extend a good mile off shore, make it dangerous, if a vessel should get embayed in bad weather.

Tides.—It is high water, full and change, in the lagoon at the entrance at 8h. 10m.; springs rise 8 feet, and in the port, 5 feet. The ebb runs in the entrance at the rate of 6 miles an hour.

Directions.—The best time to enter port Salvador is at low water, or the early flood; and to leave it at the last quarter ebb. The usual passage in, with a fair wind, is westward of Centre island. In working in, after passing well to the southward of Mid rock, it is advisable to cross over between it and the island, and work up on the eastern side, as the water is not so deep, nor the tide so strong as on the other side of the island.

After passing Centre island there is more working room, and anchorage for one vessel may be obtained at the mouth of the lagoon, on the west side, in 7 fathoms good bottom, but it shoals suddenly to 2 and 3 fathoms. Having cleared the entrance channel, good and secure anchorage is found all over the port. The strength of the tide is trifling everywhere, except in the channel and between some of the islands, and there it seldom exceeds 1½ or 2 miles. The dangers are nearly all visible. The coves and creeks abound with fish, and the shore with cattle, rabbits, and wild fowl, heath fuel, and good water.

CAPE CARYSFORT.—Macbride head is situated about 11 miles eastward of port Salvador, and cape Carysfort, 150 feet high, is 6 miles beyond. Both these capes are cliffy, and a projecting point between them has small detached rocks off it, which show plainly in coming along the land. Cape Carysfort may be passed at a mile distance, and the low land and rocky islets, which form Volunteer point, will then be distinctly seen.

Cow bay lies close to the southward of cape Carysfort, and affords clean sandy anchorage in 7 or 8 fathoms, open to the eastward. It is easily known by its white sandy beach, and the bluff land about the cape; and, at the close of the evening, vessels bound to Stanley might find it convenient to drop an anchor here for the night.

URANIE ROCK lies E. ¼ S. one mile from the rocky islets off Volunteer point; a berth of 2 miles, therefore, should be given to them in order to clear this rock. It is the more dangerous, as with westerly winds the sea seldom breaks on it, and it is without kelp. By keeping cape Carysfort to the westward of W.N.W., until mount Low bears S.W. ¾ S. or cape Pembroke light S. ¼ W., a vessel will pass nearly 2 miles outside of it, and may then haul up for mount Low, the most eastern high hill on the island. The mount may be easily seen, on a clear night, when to the northward of Volunteer

point; the summit, which is 840 feet high, forms two peaks, and from the eastern one the land slopes down to the point that divides Berkeley sound from port William.

BERKELEY SOUND.*—The entrance to this capacious sound opens out directly after passing Volunteer point, and cannot be mistaken. It is 4½ miles wide at the entrance, between Eagle point on the north and Kidney island on the south, and 16 miles in length; terminating in the three excellent anchorages of Johnson harbour, Stag road, and port Louis. After passing Eagle point, from which a reef extends half a mile, the sound is clear of all danger up to Sea Lion rocks. These rocks appear at a distance like two or three small boats; and vessels bound to either of the above three anchorages should in the first instance steer for these rocks, the dangers round which are well marked by kelp.

Berkeley sound may be entered by night, if the entrance is made out before dark; and may even be worked into safely, till nearly abreast of Johnson harbour, where a vessel can anchor in 12 to 15 fathoms, outside the kelp patches off Long island; but rather to the southward of mid-channel, to avoid getting too close to Sea Lion rocks, which cannot be seen on a dark night.

Johnson harbour, in the north-west corner of Berkeley sound, is two-thirds of a mile wide at entrance, from kelp to kelp, which shoots up there in 5 or 6 fathoms, and marks well the limits of the channel. Off Lamarche point the kelp will be seen to run out a long way, with another large patch opposite to it, which together, narrow the passage to a third of a mile. After clearing these, the vessel may boldly proceed up the harbour and anchor off Magellan cove, in 5 to 6 fathoms, mud. H.M.S. *Conway* found the ground there so tough that in weighing the anchor, the head of the capstan was wrung.

The watering-place is at the north-west corner of Magellan cove, but it is inconvenient, as the beach shelves out a long way. If not in want of water, a better berth may be found farther to the westward, for the sake of shelter during heavy south-west and southerly gales, which raise a heavy sea off Magellan cove: the landing, also, is more sheltered on the western shore.

Stag road offers a still better anchorage for large vessels, off Bougainville creek; the two large kelp patches may be passed close to,

* *See* Admiralty plan:—Berkeley sound, No. 1,326; scales, *m* = 1 and 2 inches.

and a large vessel may work in, and anchor in 4½ to 6 fathoms in any part of the road. The best berth will be found in mid-channel, between Hog island and the north shore; but it is 2 miles from the watering-place, which is to the westward of the Carenage.

Port Louis, in the western extremity of Berkeley sound, has its main entrance between Long island on the south, and Peat islet and Hog island on the north; but a rocky patch nearly in mid-channel contracts the passage to a breadth of little more than a cable. After passing this patch, keep to the northward of Round island.

This anchorage is nearly land-locked; the most convenient berths for small vessels are off the Carenage, in 3 fathoms, about a quarter of a mile from the shore; or farther to the southward, in 3½ or 4 fathoms.

The Carenage, at its entrance, is scarcely more than 100 yards across, but expands to a sheet of water of nearly a circular form, and nearly half a mile wide; from the shoalness of the water, however, it is only adapted for boats. The old settlement was on its western side.

Tides.—It is high water, full and change, in Berkeley sound, at 5h., springs rise 7 feet.

CAPE PEMBROKE.—LIGHT.—Cape Pembroke is the eastern extreme of a white sandy promontory forming the south side of port William. About 100 yards from its extremity is an iron circular tower, 60 feet high, painted white, from which is exhibited, at an elevation of 110 feet above the sea, a *fixed* white light, visible seaward from a distance of 14 miles in clear weather. The light is not visible towards port William, or between the bearings of S.E. and N.E. ¾ E. Uranie rock bears from it N. ¾ W. distant 9½ miles, and Wolf rock and reef, which is triangular, and about 600 yards in length, each side, bears S. ¾ W. 2¾ miles.*

Pilots, will be found off the lighthouse, for port Stanley.

PORT WILLIAM, which includes Stanley harbour, is entered between William point on the north and cape Pembroke on the south, a distance of 2⅓ miles, and is well marked by the lighthouse on the latter. It affords good anchorage, sheltered from all the prevailing winds.

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* *See* Admiralty plan:—Stanley harbour with ports William and Harriet, No. 1,774; scale, $m = 2$ inches.

William point is low and rocky; near its extremity is a beacon having a basement of stonework surmounted by a triangular top, 26 feet high, which is visible in clear weather from a distance of 5 miles.

Charles point, also on the north shore, has two small detached rocks at its extremity, off which there is a kelp patch, extending about a third of a mile; there is deep water close to the edge of the kelp.

Seal rocks lie about three-quarters of a mile north-eastward of cape Pembroke, and are clean on all sides. The tide runs north and south 3 miles an hour between the cape and the rocks, the flood stream setting to the northward and the ebb to the southward.

William islets lie about half a mile off the south shore of port William between cape Pembroke and Yorke point, and are steep-to beyond the kelp.

Billy rock lies between William islets and Seal rocks, and with cape Pembroke lighthouse bearing S. ½ E., distant 4½ cables. It shows at half tide, or when there is much swell, but at high water it is covered; there is a little kelp close around, and deep water close to its east side. This rock is more particularly to be guarded against, in leaving port William to pass round cape Pembroke, with an ebb tide; for there is no tide felt while running out of the port till near the rock, and then the outside tide being met running strongly to the southward, it is very likely to sweep a vessel towards the rock, unless allowance be made for it. The passage between Billy rock and East William islet should not be attempted.

Yorke point, about one mile west of William islets, on the south shore, is steep-to and may be approached to 100 yards. The entrance is wide enough for large vessels to work in, and the edge of the kelp is a secure guide; but the white sandy bay on the south side should not be entered, as it is shallow. In standing towards it, a vessel should tack when in the line of the islets and of Yorke point. When past Yorke point, Sparrow cove will be seen open on the north side of the port, under mount Low, and the entrance of Stanley harbour, on the south side.

Anchorage.—Vessels that remain in port William will find good anchorage in Sparrow cove, and an unfailing supply of good water in its north-west corner. Nearly half a mile from the entrance of the

cove is Doctor point, on which stands a sign post pointing to the Narrows of Stanley harbour; there is a similar one on Tussac point.

Murrell river.—At the head of port William, a long creek winds through the hills to the westward, up to Murrell river, its whole extent being about 3½ miles. It varies in width from 2 cables to half a cable for the first mile, with a depth of 3 to 2 fathoms, beyond which it shallows rapidly, so that a boat cannot get up until the tide begins to flow. The landing on all the beaches is bad for boats, in consequence of boulders; the best landing is on the rocks where the shores are steep-to. There is a very good watering-place on the west side of the cove on the north shore, in a bight outside the entrance to Weir creek; but care must be taken in landing on account of the stones. Nearly every hollow has a small stream running through it, and peat is plentiful.

STANLEY HARBOUR.*—The entrance to this harbour in the south-west part of port William, is little more than a cable wide, between Engineer point on the east, and Navy point on the west, both of which points may be passed at 30 yards, and all dangers are marked by kelp. The harbour is excellent, being a large natural dock, 3 miles long, east and west, by about one-third of a mile broad, and the bottom of stiff mud. On the south shore, on the slope of the Murray heights, stands the town of Stanley, the seat of government.

Supplies.—Stores of every description can be obtained in Stanley harbour. There are two hulks with means for heaving vessels down. Mutton and beef of the very best description at 4*d.* per pound may be purchased in any quantity; hares, rabbits, and fish are plentiful, but vegetables are scarce. Water is kept in a government reservoir, containing 200 tons, and it can be obtained for 2*s.* 6*d.* per ton; or water will be sent off by a private firm, at a charge of 7*s.* 6*d.* per ton. Wood is scarce, but peat, which is a fair substitute for it, is plentiful, and when compressed is found to be a valuable fuel.

Coal. — About 1,000 tons of coal are kept in stock on board the hulks in Stanley harbour. There are eight lighters, but coaling is slow. Strong winds in summer, and snow squalls in winter, interrupt coaling. Small vessels can probably go alongside the hulks.

Repairs can be effected to both wood and iron vessels.

Communication. — There is monthly communication by the steam vessels of the Kosmos Company, between port Stanley and

* *See* Admiralty plan :—Stanley harbour, with ports William and Harriet, No. 1,774; scale, *m* = 2 inches.

England, calling at Monte Video. Two small steamers trade between Stanley and the local ports.

Anchorage.—Stanley harbour is easy of access, snug and secure, but for large vessels the anchorage is somewhat confined, as the deep water space is only a narrow strip running east and west in the middle of the harbour.

A vessel drawing 10½ feet, can with an off anchor, lie securely alongside the hulk sunk at the end of the dockyard jetty. The least depth at low water springs, was 12 feet.*

Deep draught vessels should anchor south of Navy point, in 4½ to 5 fathoms; others may approach nearer the town.†

Sailing vessels bound round cape Horn should not enter Stanley harbour, as the wind which would be fair for them to sail would be foul for getting through the Narrows; they may anchor about a quarter of a mile outside the entrance, in 6 to 7 fathoms, at 3 cables from the shore, with William point just shut in; and from whence they can leave with any wind. But those coming from cape Horn may enter, as any wind which would be fair for them to sail, if bound to the northward, would also be fair to leave the harbour.

Tides.—It is high water, full and change, in port William and Stanley harbour at 5h. 15m.; springs rise 7 feet, neaps 5½ feet.

On the south-east coast of the Falkland islands there is so little tide that it need not be considered, though a current from half to one mile an hour will generally be found running with the wind; but after passing port Harriet a strong tide begins to be felt.

The flood runs to the north-east, past the Wolf rock, and becomes stronger as it approaches cape Pembroke, round which its rate is from 2 to 3 miles, according to the age of the moon. The flood runs directly to the northward of the Seal rocks to Volunteer point, while very little tide is felt within the heads of port William or Berkeley sound. The ebb runs with equal strength to the southward, and when there is a strong breeze, a heavy tide rip extends 2 miles off shore.

Directions.—Approaching from the northward towards port

* H.M.S. *Ready*, 1886.

† H.M.S. *Garnet*, 1882, moored 2 cables N. by W. of the observation spot at the dockyard, had a depth only of 3½ fathoms where 4½ is shown on the chart. The bank of shoal water appears to extend farther off from the south shore, and deeper water will be found nearer the north shore.

William with a fair wind, after rounding Uranie rock, steer for the lighthouse on cape Pembroke; some white sand-hills will then be seen ahead, and close to Kidney island; also the beacon on William point: at the same time the Seal rocks will be seen on the horizon just open of cape Pembroke. Pilots will be found ready to board vessels off the lighthouse.

Coming from the southward, with a flood tide it is necessary to guard against being swept too near cape Pembroke or the Seal rocks. With a commanding breeze, vessels have passed between the rocks and the cape, but it will be prudent to pass outside them. Should a vessel find that she is setting towards Seal rocks, the only alternative is to pass between them and the cape, as the tide sets through strongly; avoiding Billy rock 6 cables westward of Seal rocks. In passing cape Pembroke bound to the southward, the same rule applies as when bound into port William; and in light winds, or much swell on the ebb, it is better to pass well to the northward of Seal rocks, in order to allow for the tide running to the southward.

In coming from the southward in thick weather or at night, the lead will not be much guide, as Beauchêne island is on the southern edge of the bank which surrounds the Falkland islands; and the 100-fathom line only extends about 5 miles southward of it. After passing eastward of Beauchêne, a N.E. by N. course for 60 miles will clear all the islands off the south-east coast of East Falkland, making due allowance for current (*see* page 368) and the depth then will be from 60 to 70 fathoms, about 15 miles south-east of Lively island. If in daylight, and the weather be clear, the high land in the central chain will be seen a considerable distance, and a course may be steered near the coast, passing about 6 or 7 miles outside the eastern Sea Lion island, and the same distance from Shag rock (which shows high out of the water), and from Lively island. In either case after passing Lively island, a course should be steered towards the easternmost of the hills; if thick, or too dark to see the hills, a vessel will be in a very good position for waiting for daylight, and should endeavour to keep in soundings from 40 to 50 fathoms.

When the land can be made out, by bringing the eastern hill, mount Low, 840 feet high, to bear North, and keeping it on that bearing will lead into the shore, where it can be approached in perfect safety, just south of the entrance to port Harriet. The Wolf rock and cape Pembroke lighthouse will then be seen, and course may be shaped for port William. At night, cape Pembroke light will be a guide. If the wind be off the land, a vessel might pass

inside the Wolf; avoiding Maggie Elliot rock of 2¾ fathoms, distant 1¼ miles W. by N. from the Wolf, about one mile off shore, and which may not break with the wind off the land. Without a commanding breeze, it is better to pass outside the Wolf.

Coming from the northward, with westerly winds, make cape Carysfort, or with easterly winds, Volunteer point; when they are passed, steer for cape Pembroke lighthouse, until port William opens out, when run in and anchor, or wait for a pilot. In case of darkness or fog, vessels may anchor in the mouth of Berkeley sound or of port William, or stand off and on, as may be expedient, there being no danger not marked by kelp.

Directions for Stanley harbour.—If the wind be southerly, the passage into Stanley harbour should not be attempted under sail, except by a small quick-working vessel; but with the wind to the westward of S.W., it may be passed by all vessels; it is little more than a cable broad; care is, however, required in rounding Tussac point, as shoal water extends from it 1⅔ cables in a W. by S. direction. If the wind be S.W., so as to make it very necessary to pass very close to Navy point to fetch through, a vessel should work well up to windward of the entrance, and entering the passage under all sail and with good way on, directly the sails lift from the wind drawing out in passing the point, she should be kept a little higher, so as to shoot through with the sails shaking till she gets the steady wind inside the point.

When through the Narrows, the harbour may be traversed by any vessel drawing under 20 feet; there are depths of 3½ fathoms at one cable from the kelp on each side, and about 4 fathoms in mid-channel, close up to the town on the south shore. Large vessels have plenty of room to round-to and anchor in mid-channel, in about 5 fathoms, as far up as they choose to fetch. After passing the Narrows the bottom is excellent—a stiff mud, which often causes some trouble in getting the anchor up again.

Caution.—A long steam vessel should proceed well into port William, or until the entrance to Stanley harbour is well open, and bearing S.S.E., before steering towards it. And on leaving, when at the entrance, a N.N.W. course should be steered until Yorke point opens, before altering course to the eastward.

PORT HARRIET, the entrance to which is about 5½ miles south-west of cape Pembroke, is formed on the south side of the ridge

which separates it from Stanley harbour; the distance across being about 2¼ miles. Vessels working from the southward, intending to touch at port William, and finding a strong northerly breeze, and a high sea, or with night approaching, would find excellent anchorage in the entrance to port Harriet. Seal point, the south entrance point, is low, and has a round low mound off its extremity, to which it is joined by rocks; off this mound a ledge extends about half a mile to the eastward, but kelp marks its extent.

Outer anchorage.—There is anchorage in 6 to 7 fathoms, just outside a small kelp patch of 3 fathoms, lying nearly in mid-channel; or to the westward of it, in 3½ to 4 fathoms. From here supplies could be obtained from the settlement in Stanley harbour while waiting for a fair wind. There is a good stream of fresh water in a cove on the north side, about a mile inside the entrance.

The only wind that would raise any sea in the entrance would be from E.N.E. to S.E., which seldom blows; and should it rise from that quarter and be too strong to work against, by running in over the bar a secure anchorage may be found, quite sheltered.

Bar.—At about half a mile within the kelp patch, a bar extends across from Lake point, (off which there is a small detached rock,) to the south shore, at about one mile within Seal point. The deepest water on the bar is 3 fathoms, fine sand, in mid-channel, and shoaling gradually to 2 fathoms, close to the kelp on each side. It suddenly deepens on its inner edge from 4 to 7 fathoms, the bottom changing from fine sand to mud. No marks are necessary for passing over the bar, the above description being sufficient. The land on the shores of the harbour is generally swampy, and it will probably never be a port of any importance, beyond affording a good stopping-place for a vessel that cannot reach her port before night.

Harbour.—After passing the bar, port Harriet affords excellent anchorage for an extent of 3 miles, the breadth being nearly three-quarters of a mile. All the dangers are marked by kelp, except in one place about half-way up the harbour, where a sand-bank, without kelp, extends about a cable off the south shore. The best anchorage is in mid-channel, in order to have plenty of room for getting underway if the wind should be blowing strong off either shore; the depth varies from 5 to 8 fathoms, the bottom soft black mud

The head of the harbour is terminated by a creek which runs about 2 miles to the westward. It is only a cable wide at the entrance, but it gradually widens, and near the head is about half a mile across. For a mile inside the entrance of the creek there is anchorage for small vessels in 2 to 3 fathoms; but beyond that it becomes shallow and rocky, and dries at low water half a mile from the head.

Tides.—There is scarcely any tide felt in port Harriet. It is high water, full and change, at 5h. 0m. p.m., the springs rise 6 feet.

PORT FITZ ROY.—The coast between port Harriet and port Fitz Roy, 9 miles west-south-westward, is bold, rocky, and nearly straight, except about half-way, where there is a small bight with a white beach open to the eastward. From port Harriet to Beach point there is no danger outside the kelp that fringes the shore; but between this point and East island, which forms the south entrance point of port Fitz Roy, there are numerous kelp patches. From Beach point the coast trends W.S.W. for 4 miles, terminating in a bay, the south horn of which is Bold point, the north entrance point to port Fitz Roy. This bay is opened to the eastward, and in the middle of it there is a rock dry at low water, and surrounded by kelp. At the north side of the bay is a narrow inlet, leading to North basin, and passing through a gorge in the ridge of low hills; the depth in the narrow part is about one fathom. The basin is one mile long and very shallow.*

A Bar extends across the entrance of port Fitz Roy, from the west end of East island; the deepest water is close to the south edge of the kelp patch on the north side of the bar, where there is a depth of 3 fathoms, gradually shoaling to 2 fathoms close to the kelp off East island: to the northward of the kelp patch there is a narrow passage with 2½ fathoms, but it can only be passed through with a fair wind.

Anchorage.—For 3 miles above the bar the port is fully a mile wide, and quite clear of danger to within 2 cables of the shore, and to near that distance the kelp extends. This wide part affords excellent anchorage; the depth varies from 6 to 4 fathoms, and the bottom is mud. Off White point on the north shore, a sand pit, without kelp, and with less than a fathom of water, extends off about 2 cables: it is easily seen, as the water looks quite white.

* *See* Admiralty plan :—Port Fitz Roy and port Pleasant, No. 1,956; scale, $m = 1{\cdot}7$ inches

East road.—Between the west end of East island and the point of the mainland forming the south shore of the port are several small islets, between which there is a deep, but narrow and winding channel into the port. The channel is well marked by kelp, and the depth of water in it varies from 4½ to 7 fathoms; some rocks nearly awash lie very close inside the kelp edge, on both sides of the channel.

A large vessel, however, should not attempt the channel into port Fitz Roy through East road, unless the wind be between South and East; or to come out, unless between North and West, as nothing but a small craft could work through it, and in some parts it is too narrow to bring up a large vessel. The middle part of the channel opens out to about a third of a mile in breadth, and forms a nice anchorage for small vessels.

Fitz basin.—On the north shore of the port there is a remarkable gorge in the ridge of low hills, through which a narrow inlet runs for about half a mile, with a depth of 1½ to 2 fathoms; it then opens out into Fitz basin, large and shallow, like that of North basin. Westward of the basin is Fitz cove.

Head of the port.—About 3 miles inside the bar the port is divided into two arms by a peninsula and Tussac island. The southern arm, about 1½ miles in length, is very shallow, and nearly all covered with kelp, except close to Tussac island, where there is a small patch of clear ground with 2 fathoms water.

To the northward of Tussac island, and directly in the middle of the entrance to the northern or main arm, there is a large patch of kelp, with only 6 feet on it. On the north side of this patch there is a channel a quarter of a mile wide, with 3½ fathoms water for about a mile; and about one mile beyond will be found the best anchorage for small vessels, in 2½ fathoms soft mud, abreast Garden point, on the north shore, where the arm turns to the northward. Off Garden point and the point on the opposite shore some rocks dry at low water, but the kelp extends well outside them, leaving a passage in mid-channel nearly 2 cables wide; the arm then opens into a broad space, but all shallow, except in the channel, which is about one cable wide, with a depth of 2 to 3 fathoms.

On the north side of this open space there is a narrow opening, through which the channel runs to its eastern shore, and so steep-to that vessels may lie alongside the rocks in 4 fathoms, which would only require levelling to make excellent wharves; but the channel

is hardly wide enough for swinging a long vessel, the opposite side being low, with rocks lying some yards from the shore. Inside this passage it opens out again to a wide creek which runs above 2 miles to the westward, and ends in a small fresh-water river. Much of this upper space is dry at low water, so that a boat cannot get within a mile of the river. There is good anchorage for small vessels for half a mile inside the narrows, in 2 and 3 fathoms, muddy bottom.

Tides.—There is scarcely any tide to be felt in port Fitz Roy, except through East road entrance, where it runs about 1½ miles an hour; in the narrows near the head it is rather stronger. It is high water, full and change, at 4h. 45m., springs rise 6 feet.

Directions.—It is difficult to make out the entrance to ports Fitz Roy and Pleasant when standing in direct from seaward; as the land round them is low, and the points cannot be made out distinctly till close-to. The best guide is the high range of hills north of port Fitz Roy, with three peaks near each other, the middle one showing a broad flat summit. The westernmost and highest of these, mount Kent, 1,535 feet high, bearing N.W. by N., will lead directly to the entrance of port Pleasant, and clear of the large kelp field, south of Pleasant road. The same hill bearing W.N.W. will lead direct to the end of the kelp off East island, and when near, the kelp will guide into either channel of port Fitz Roy.

The best course into port Fitz Roy, coming from the eastward, is to the northward of all the kelp patches between Beach and Bold points, keeping close to the kelp on the main shore, where the passage is, in the narrowest place, above a quarter of a mile wide; but if the wind be blowing hard from the southward, it would be advisable to keep to the southward of all the kelp patches, and run for the large kelp patch that extends above a mile off the east end of East island. Following the inner edge of this kelp patch, will lead direct into port Fitz Roy; but when abreast of the island, keep towards the north shore, passing just south of the large kelp patch which lies north-west of the bar, and between the two channels.

PORT PLEASANT,* which is immediately south of port Fitz Roy, has two entrances; formed by Pleasant isle, a long narrow island, with some small islets. These islets are surrounded by a large and thick kelp patch 2 miles in length, the edges of which are

* *See* Admiralty plan :—Port Fitz Roy and port Pleasant, No. 1,956; scale, *m* = 1· inches.

the best guides into both entrances. Off Pleasant point, the south entrance point, a kelp patch extends above a mile to the eastward, with rocks which break heavily with southerly gales. Mount Kent bearing N.W. by N. is a good mark for making the port.

Bars.—Each channel into this port has a bar across the entrance. The bar in the north channel is abreast the second of the small islets; the bar in the south one is a little inside the east end of Pleasant isle; the deepest water on both is 2½ fathoms, but vessels drawing 17 feet might enter with a leading wind, during the last quarter flood. The north bar carries its 2½ fathoms right across to the kelp on each side; but the south bar has only 2½ fathoms close to the island kelp, and thence it shoals to 1½ fathoms on the south shore. The north channel is therefore the best for large sailing vessels; but they must have a fair wind, as a little above the bar the channel is contracted to about 100 yards by one of the small islets; but there is a depth of 8 fathoms water there, quite steep-to on both sides. Inside this, the harbour expands to about three-quarters of a mile, and continues that breadth till it is joined by the south channel, round the west end of Pleasant isle; the bottom in all this space is soft mud, the depth varying from 10 to 6 fathoms.

After passing the bar at the south entrance, the depth will be 4 fathoms to where it joins the north channel; but about a mile inside the bar, off a remarkable white sand patch on the south shore, there is a low projecting patch of rocks, nearly covered at high water, from which a sand-bank extends, with less than one fathom. The water over the bank is quite white, and it may easily be seen; but the best way is to keep the island kelp close aboard when entering by the south channel, and directly the vessel has passed the west end of the island stand over to the north-westward, as along the south shore there is a shallow bank.

Island harbour.—At the head of port Pleasant, beyond Turn point, there is a narrow opening to a large inlet, which winds through the hills for about 3 miles to the south-west, and then leads into Island harbour. For the first mile, the inlet is about a third of a mile wide; it then opens out to a space about three-quarters of a mile each way; the deep channel runs close to the south shore of this space, and then turns to the southward, into the narrow part of the inlet, which for 2 miles is scarcely half a cable across. There are depths of 4 and 5 fathoms in the channel, and though it occasionally crosses from side to side, no small vessel would find any

difficulty in sailing through with a fair wind. Island harbour is nearly all shallow, but there is space for small vessels to moor in 2 to 3 fathoms. A mile from the head it is nearly dry at low water.

The shores of port Pleasant are the favourite resorts of numerous herds of cattle, perhaps in consequence of its fresh-water lakes, on the banks of which a short rich grass grows.

Tides.—The tide in both entrances of port Pleasant runs nearly a mile an hour at springs; and in the narrow pass of the North entrance, nearly 2 miles. It is high water, full and change, at 5h. 0m., springs rise 6½ feet.

Pleasant road, immediately to the southward of port Pleasant, is well sheltered from the southward and south-eastward by a bed of kelp, which extends 3 miles off shore, and is 3 miles wide; in this kelp are three small islands about a mile off shore. The road is exposed to north-east gales, but they are not frequent; and the holding ground is good, being sand with a stiff clay under it. The *Arrow* rode out a north-east gale here.

Kelp lagoon is a shallow piece of water, south-west of Pleasant road. It is about 3½ miles long, from one to 2 miles wide, has several islands in it, and two entrances; but both of them are blocked up by kelp, which extends nearly 2 miles off shore, and is a continuation of the large kelp patch south of Pleasant road.

CHOISEUL SOUND is 26 miles in extent from east to west, 3½ miles across at the entrance, between Fox point and Lively island, and gradually becomes norrower towards its head. In the western corner is a long and narrow inlet, named Bodie creek, which extends about 4 miles to the westward, and varying in breadth from a quarter of a mile to 100 yards.

The whole of Choiseul sound is studded with islands which form well-sheltered anchorage for small vessels; there are also numerous creeks and coves, in many of which they may lie securely. Large vessels can bring up in almost any part of the sound in 12 to 18 fathoms water; the bottom is mud, but generally covered with shells and weed, which give it, on the arming of the lead, the appearance of a rocky bottom, but all the rocky dangers are marked by kelp. The shores of the sound are all low and intersected by numerous ravines with small streams in them; but many of these

are dry in the middle of summer, particularly to the southward of the sound.*

Fox point, about 9 miles south-west of Pleasant road, forms the north point of entrance to Choiseul sound, which is best known coming from the eastward by the long white sandy beach to the north-east, with a small dark islet (Direction islet) that shows plainly on the white ground behind. Fox point is the southern extremity of this long beach, with a small islet off it, and kelp extending about 2 miles farther to the eastward. The entrance, between the main land and Phillimore island, is 3 miles wide, divided into two channels by Middle island, which lies nearly one mile off Phillimore island. A long kelp patch runs 2 miles eastward from Middle island, and on it are two small islets with a large black rock near its outer extremity. The best channel into the sound is northward of Middle island, between it and two Black rocks, which are several feet above water, and lie about half a mile off the north shore, with a long tail of kelp to the eastward. There is a passage with 3½ fathoms between the rocks and the shore, but only small vessels can work through it. The channel between Middle island rocks and Black rocks is about one mile wide, and clear of all danger, except two or three small patches of kelp inside, which are easily seen. The channel between Middle and Phillimore islands is deep, and three-quarters of a mile wide, but full of large kelp patches. Westward of Middle island the south channel is divided by Green island.

Mare harbour.—After passing the Black rocks, in the north channel to Choiseul sound, the first opening in the north shore leads into Mare harbour, one of the finest on the coast, and easy of approach for the largest vessels. The entrance is 1½ miles wide, but the kelp extends a long way off the western side, from Seal island, contracting the channel to less than half a mile; but inside, it opens into a clear piece of water, about 1½ miles long and one mile wide, with excellent anchorage in 6 to 10 fathoms, muddy bottom. Cattle are numerous. The soil appears good, and there are no swamps, except in the bottoms of the valleys.

East and West coves.—On the east side of Mare harbour an opening about 2 cables wide leads to East cove, another very fine harbour, and the best for a vessel that intends to remain a long time; but with westerly winds a large vessel could not work out.

* *See* Admiralty plan:—Choiseul sound, No. 2,671; scale, m = 1·4 inches.

It is about three-quarters of a mile wide, and its east end terminates in two coves, with sufficient water for small vessels.

On the western side of Mare harbour there are also two coves; one of them, West cove, is nearly 3 miles long, and for nearly 2 miles affords good anchorage for small vessels, in 3 fathoms water.

Swan inlet stretches 7 miles to the north-west from the northern side of Mare harbour, and terminates in a small river. For 5½ miles this narrow inlet has a depth of one to 2 fathoms; it then opens into a wider space, and becomes so shallow that a boat cannot go higher at low water. In some parts of the inlet, the shores are so steep that a vessel may lie alongside the rocks. Water can be found in most of the hollows, but the smaller streams are dry in the middle of summer.

Victoria harbour.—On the south side of Choiseul sound, abou 12 miles west of the entrance, is Victoria harbour. It is formed by a peninsula, 7 miles in length, extending to the eastward parallel to the shore; the first 4 miles of which has good anchorage for large vessels, in 5 to 10 fathoms. Off the entrance there are two clusters of islands, between which and the shore there is also excellent anchorage.

John point.—The bottom of the bay close westward of John point, on the north shore, is rocky, which renders it an unsafe anchorage.

Darwin harbour.—In the north-west corner of Choiseul sound there is also a good harbour, but the entrance, which lies between two large clusters of islands and Squib point, is narrow.

Vessels in entering Darwin harbour follow the curve of the kelp and islets forming the west side of the narrows, until abreast Squib point, when they should borrow on the eastern shore before turning into the anchorage, to avoid the shoal ground and kelp extending from the north-east side of the island on the west side of the channel.

The kelp and rocky ground of less than 3 fathoms extend south-east about 5 cables from Squib point.

Hare island.—Kelp extends for a distance of 1½ cables from the north-west side of Hare island. This island is the nursery for hares.

Settlement.—In Darwin harbour, at about one mile northward of Teal creek, on the south side of a bay on the western shore, is the settlement; of about 15 houses.

Arrow harbour.—To the southward of Darwin harbour entrance there is another good anchorage in Arrow harbour, southward of Arrow island, in from 4 to 5 fathoms.

Tides.—It is high water, full and change, at Mare harbour, Choiseul sound, at 6h. 0m., springs rise 6 feet; the tides run nearly a mile an hour at the entrance.

There is but little tide in Choiseul sound, except in the entrances to creeks and between the islands. In the south entrance to the sound, also, both ebb and flood are strong; at springs about 1½ miles, and when blowing hard they cause a ripple off Pyramid point, which is dangerous for a boat. The flood sets to the northward in this entrance, but in the north entrance there is scarcely any tide, and the little flood there is runs to the eastward out of the sound.

LIVELY ISLAND AND SOUND.—Lively island, lying off the entrance of Choiseul sound, is 6 miles long by 5 miles broad; reefs, with passages between, extend 4 miles off its north-east point; also reefs extend from the south-east and south-west points. South-westward of Lively island there is good temporary anchorage on the west side of Lively sound, to the northward of Motley island. Kelp extends half a mile south-westward of Motley island. Any vessel bound to the westward, and not able to reach Bull road before dark, would find this the best anchorage; but if it should be blowing hard from the southward or south-east, a heavy swell would set into Lively sound. In which case it is safe to run up the sound, taking care to avoid the shoal extending 1½ miles westward of Sal point and the shoal off Seal island; and either haul to the westward into Seal cove, or pass farther on, and anchor on the north side of Pyramid point, in Pyramid cove, where there is good anchorage, in from 5 to 8 fathoms, sandy bottom, with a stiff clay beneath.

Kelp bay.—Good anchorage is also to be found in Kelp bay, on the north-west side of Lively island, in 8 fathoms, broken shells, with an under surface of mud; with the west extremes of Phillimore (main) island and Reef island N. by W., and north end of Kidney island W.S.W. It affords shelter from N.N.W. through East to W.S.W.

Seal cove.—For vessels going to remain any time there is no spot

superior to Seal cove. It is sheltered from every wind, the land round it is very good, particularly in the valley between it and Low bay, and it is well watered. There are large rivulets running into the head of the cove, and several small streams on the north shore close to where vessels would anchor. There is deep water close round the kelp, on the north side of Seal island; and though long kelp reefs project from it, there is plenty of room.

LOW BAY has its entrance between the north point of Bleaker island and the rocky Triste islands on the opposite shore, 3 miles apart; inside which the bay expands to a breadth of 8 or 9 miles, with depths of 15 to 22 fathoms.

This bay is indented with several bights and bays, and although inviting in appearance they are not advisable anchorages, as the ground is rocky and foul in many parts, and a heavy swell rolls in with southerly gales. There is no danger in it except a patch of rocks, dry at low water and fringed with kelp, lying on the western shore midway between Bluff head and Turn island: the outer edge of the patch bears from Bluff head S. by W. 1¾ miles. Bluff head may be easily recognised, being a dark bluff cliff of 60 feet in height, and the most conspicuous object in the bay, with a small islet close to it. The character of the land in this part of East Falkland and to the southward, is low, few places being of greater elevation than 150 feet.

Tides.—It is high water, full and change, in Low bay at 5h., springs rise 5½ feet; the rate of the tide at the entrance is about one mile an hour.

SHAG ROCK, lying about 5 miles off the entrance to Low bay, is an excellent guide when running from the southward for either Lively sound or Adventure sound. It is a high peaked mass which can be seen 5 or 6 miles, and there is no other island that resembles it; while the low land is all so much alike, that it is almost impossible for a stranger to recognise his landfall, particularly as the high range of hills is seldom seen so far south; but the Sea Lion islands, or the Shag rock being made out, the chart will show the bearings of the points.

BLEAKER ISLAND is a long, low, narrow island, lying at the entrance of Adventure sound. A bay on its north-east side, north of Sandy bay island, forms the most convenient stopping place between

Lively sound and Bull road; the water in it is deep, and the vessel has to work close to its head, to get as little as 12 fathoms, but she is then well sheltered from almost every wind. The anchorages are very good inside Bleaker island, but as there is no passage out between the south-west end of the island and Driftwood point, they are not convenient for vessels bound to the westward.

Between the north end of Bleaker and North Point island, there is a passage for small vessels with depths of 5 or 6 fathoms. At 3 miles south from North Point island is Halt island, with a long kelp spit running off to the northward, but affording for small vessels a fair anchorage inside it, in 6 or 7 fathoms, over a bottom of stiff mud. There are no other anchorages around Bleaker island. To the south-westward, long spits run off the points of the island, and there are several kelp patches, but the water is deep between and around them. There are ponds of fresh water on the island, quantities of wild fowl, and heath fuel.

ADVENTURE SOUND is about 20 miles in length from Bleaker island to its north-west extremity, and its general breadth between 3 and 4 miles. It contains several good harbours, and various creeks and coves; those on its south-west side are to be preferred, being sheltered from the prevailing winds. It has several islands, and its shores are fringed with kelp. The two best harbours are in the southern part of the sound; the principal one, Adventure harbour, the other Moffit bay, 1½ miles to the southward of it. Barrow, Fox, and Sulivan harbours lie north-westward of these. The creek and coves on the north-east side of the sound are only fit for boats and small vessels.

Adventure harbour.—This fine harbour is fit for vessels of any class; and excellent fresh water may be obtained from the ponds, which are frequented by quantities of wild fowl. In proceeding to it, having rounded Bleaker and North Point islands, a S.W. by W. course 4 miles will lead to abreast Little island, which is a small dark-looking mound of tussac; from thence, a S.S.W. ½ S. course, nearly 3½ miles more, will lead to the entrance of the harbour, which is clear of all danger, and in which a good berth may be taken in from 5 to 12 fathoms, stiff mud. A look-out must be kept in going up the sound for a kelp patch, lying S.S.E. ½ E., distant 1¼ miles from Little island, and about the same distance from the Sisters: there is, however, plenty of water close to the kelp.

Fuel may be had here for daily use in the dry season, by gathering

the heath, the resinous qualities of which cause it to emit a very powerful heat, and it cooks excellently. Drift-wood also may be procured from the sea-coast, but it lies at a great distance, and requires much time and labour to collect.

Moffit bay lies 2 miles southward of Adventure bay, and has depths of 7 to 10 fathoms. This bay is not so easy of access as Adventure bay.

Barrow harbour lies about 3 miles north-westward of Adventure bay. If proceeding for this harbour, after having passed Turn and Large islands, which have deep water close to them, little direction is necessary, as no danger exists in the passage. Steer to pass close north of Kelp island, which is steep-to on the northern side. On gaining the harbour, a berth may be taken in any depth of water from 4 to 10 fathoms, good bottom. For small vessels either of the arms will be found equally convenient. Good water and fish may be procured here as plentifully as in Adventure harbour.

Fox harbour, the next anchorage to the northward of Barrow harbour, is not so desirable, as it has less water, and there are some shoals; it is, however, a good place for small craft, and fish abounds in its creeks, from November to February.

Great island lies off the north point of entrance to Fox harbour, and from its north point a rocky spit extends half a mile to the northward, partly dry at low water, with 4 fathoms close to the kelp Between the island and Low point there is a passage for boats and small craft, with 3 fathoms water. The shore from thence to the Promontory, east side of Sulivan harbour entrance, is only fit for small vessels to navigate; several kelp patches lying off it. A patch of kelp, with 5 and 6 fathoms close to its edge, lies nearly half a mile S.E. by E. from Great island: and also a small round island, named the Button. E. by N. ¼ N. of Great island; there is, however, deep water between them, but the passage is narrow.

Vessels proceeding to the upper part of Adventure sound, after passing Turn island and Shell point, must keep a look-out for a small kelp patch nearly midway between Shell and Button islands, and bearing from the former W. by S. rather more than a mile. Then, passing a quarter of a mile to the north-eastward of Great island spit, a W.N.W. course for 3 miles will lead between Promontory and Saturday points.

Sulivan harbour has a good anchorage, with depths of 3 to 6 fathoms, muddy bottom. Up the creeks and arms there is abundance of fish, wild fowl, and good water.

West arm.—Small vessels may proceed up the West arm, by keeping close to the north shore when abreast the little spit that extends from the opposite side; the passage there is very narrow and the tide runs out strong, but there is plenty of water. Small craft may also anchor inside North island.

Tides.—It is high water, full and change, in Adventure sound, at 5h. 30m.; springs rise 5½ feet. With the exception of the narrow passage in the West arm, the tides are very weak.

SEA LION ISLANDS consist of one large and three small islands lying 10 miles southward of Bleaker island. They extend in an E. by N. and W. by S. direction about 10 miles; and distant 3½ miles N.E. by E. ½ E. from the eastern islet is an outlying reef. There is a safe passage between the islands just eastward of the large one; but a long reef which breaks heavily extends 3 miles to the southward of that island, for which a good look-out must be kept, in running for the opening.

BEAUCHENE ISLAND, the summit of which is in latitude 52° 54′ S., longitude 59° 12′ W., is about 2 miles long and half a mile across. Its northern point rises to a green mound 271 feet high; the southern end is less than half that height, and is all rocky; the south and east sides form high cliffs, but the west side slopes gradually to the sea. There is no known danger beyond a quarter of a mile off shore.

Mintay rock.—A sunken rock is said to exist 3½ miles S.W. by S. from the south extreme of Beauchene island; care should therefore be exercised when passing to the southward of the island.

Directions.—Vessels from the southward, bound to Stanley harbour, should make Beauchene island. If wishing to get into a port before dark, they should endeavour to make the west end of the Sea Lion islands in order to haul up for Bull road; or, if daylight allow, by making the Shag rock they may run for Lively or Choiseul sound.

BAY of HARBOURS,* situated westward of Bleaker island and Driftwood point, extends 15 miles in a north-west direction, contracting to 1¾ miles between West and Cattle points. Nearly midway, in the entrance, and N.N.E. 4 miles from Bull point, is Middle shoal, with a rock awash at low water.

Bull road, in the south-west part of Bay of Harbours, is by far the most convenient anchorage in the southern part of East Falkland. Large vessels can work into it, and by anchoring close to the shore, on the south side of the road, off the entrance of Bull cove, the large kelp reefs on the north side of the point will completely shelter them from easterly winds. The bottom is good, in from 7 to 10 fathoms. Except during a very dry summer, there is fresh water in all the bights on the south side of the road, but the best watering-place is in a cove on the western side, off which there is good anchorage.

In approaching Bull road, care must be taken to avoid the kelp patches, indicating shoal water, 1½ miles south-eastward of Porpoise point; also the kelp patches extending one mile north-eastward of Bull point and Porpoise island. By following the edge of the kelp to the north-west, it will lead into the road. The chart and the kelp will be the best guides in this, as in every part of the Falklands.

Fanny road is the only other advisable anchorage to the southward of west point. It is formed by the Fanny islands and West point, and shows three beaches of white sand; and is secure, with a good depth of water over a bottom of sand and mud. No direction is necessary beyond a look-out to be kept for a small kelp patch, which lies half a mile north-eastward of Fanny islands.

Large vessels bound up the bay, with a leading wind, should keep a mid-channel course between Cow point and Little Harbour island, to clear the kelp spit, which extends south-eastward from Kelp island. A course N.W. by W. ½ W. for 5 miles will lead past West and Cattle points, and clear of three kelp patches which lie N.W. by W. ½ W. 1½ miles from West point.

Snug cove.—North-westward of West point there is good anchorage for large vessels westward of the three kelp patches, and southward from the cliffy point forming Snug cove, in depths of

* *See* Admiralty plan:—Bay of Harbours and Bull road, No. 1,935; scale, *m* = 1 inch.

from 8 to 15 fathoms; the bottom is mud and sand, and it is advisable to moor.

North and North-west arms, and the several creeks, present for vessels of moderate tonnage secure and snug berths; the only direction necessary for them is to look out for the kelp running off the points and islands, and which is generally bold-to. Here, as in Adventure sound, the hills seldom exceed 150 or 180 feet in height, and are of an uniform appearance. Fish and water are procurable.

Tides.—It is high water, full and change, in the Bay of Harbours at 6h., springs rise 5 feet, with little or no velocity.

The tide sets to the westward during the flood along the whole south shore of East Falkland; its strength is from one to 2 miles an hour, but near Porpoise point, the south-west horn of the Bay of Harbours, it is nearly 3 miles, and with westerly gales forms a strong race. The stream turns when it is high water by the shore.

EAGLE PASSAGE, situated between the south-west end of East Falkland, and Speedwell, George, and Barren islands, is not recommended for large vessels, as there is a tide of 3 miles an hour, with races in the narrow parts. Vessels in passing through may go on either side of the kelp patch which lies 1½ miles west-north-westward of Blind island. The only other obstruction in the passage is Mid island, with its reefs marked by kelp, extending three-quarters of a mile N.W. by N. and east of the island. The sea breaks heavily on them in bad weather, as it dces on all the coast from Porpoise point to Mid island, after passing which the channel becomes narrow but clear of danger.*

Barren and George islands.—Owen Road.—Of the group of islands that form Eagle passage, Barren and George islands are the southernmost, and between them there is good anchorage for any kind of vessel, in Owen road. But in coming from the southward, to enter Eagle passage, care must be taken not to pass nearer to Barren island than 3 miles, as the two Barren reefs extend off fully 2 miles in a north-easterly direction, and at 3 miles distance E.S.E. from the centre of the island there is kelp and foul ground. From the western point of George island a reef runs off about 3 miles to the south-west, with kelp extending 2 miles farther in the same direction.

* *See* Admiralty chart:—Falkland islands, No. 1354 *a*; scale, *m* = 0·3 of an inch.

The south channel from Owen road, between George and Barren islands, having been partially examined, is reported to be good, the least water obtained by H.M.S. *Dwarf* in passing through, was 4 fathoms.

Directions.—Vessels entering Eagle passage from the southward, should not haul up for the anchorage in Owen road until the passage between Barren and George island is open, or until the north point of Barren island bears S.S.W. ½ W., and the north point of George island W. ½ N.; then a S.W. course will lead to the anchorage. There is a kelp-covered reef, half-way between the eastern points of George island and Barren reefs; the passage recommended, which lies to the southward of it, is more than a mile wide and quite clear.

With a south-west gale, a vessel may work in to Owen road, as the water is quite smooth; and with a south-east gale, which causes the heaviest sea on the coast, she will ride in smooth water, if the north-east part of Barren island bears northward of East. A good position is in from 8 to 10 fathoms, close off George island; the bottom is chiefly stiff clay covered with a crust of broken shells. Straggling stems of kelp will be seen, but they are of no consequence. Large vessels should anchor before shutting in the points of the southern passage. These islands are well supplied with water from many lakes; the largest is on George island, and is nearly a mile in extent.

Speedwell island, to the northward of George island, is the largest of the group, being 9 miles long and about 3 miles broad; it is low and flat, about 70 feet high, and visible about 9 miles. Pigs, geese, snipe, and rabbits are plentiful on the island, and abundance of drift-wood on the western shores.

Halfway cove. — Speedwell island has two good anchorages for small vessels on its north-eastern side, where fresh water is procurable. Half-way cove, the first of these anchorages, lies immediately to the southward of a small rocky islet; but it is small and requires quickness in coming-to an anchor. There is kelp on both sides, but not less than 5 or 6 fathoms water on its edge; the holding ground is excellent, and the depth from 5 to 8 fathoms. The second or northernmost anchorage is about a mile within the north point of the island, in the first sandy bay seen, when standing along the island to the southward. Care is necessary when approaching this

anchorage from the northward as shoal water extends about half a mile from the north-east part of Speedwell island.

Between George and Speedwell islands there is a passage for small vessels, but it requires a good pilot, as there are some rocks in it. It is sometimes used by small craft, in running for the southern anchorage of Speedwell island. In making for either of the anchorages on the north-eastern side of Speedwell, from the northward, keep about 2 miles to the north-eastward of Elephant cays, and well clear of the kelp off the islet between them and Speedwell.

Elephant cays, lying off the north-west end of Speedwell island, are low sandy islets, surrounded by reefs and kelp; there is no known passage between them and Speedwell. Kelp extends nearly three miles N.N.W. of the cays, and depths of 6 to 7 fathoms were obtained 2 miles north-westward; a spot which occasionally breaks, marked by kelp, lies one mile south-west of Elephant cays. A wide berth should be given to them.

Tides.—It is high water, full and change, in Eagle passage, at 8h., and the rise and fall is 4 feet; the flood setting through to the northward, and the ebb to the southward, at a velocity of from 2 to 3 miles an hour, but greatly influenced by the winds.

CHAPTER XI.

FALKLAND SOUND.—WEST FALKLAND ISLAND.

Variation in 1893.

Falkland sound - 13° 10′ E. | Jason islands - - 14° 10′ E.

FALKLAND SOUND,* which separates the two main islands of East and West Falkland from each other, extends 45 miles in a northerly and southerly direction, and varies in breadth from 13 to 2½ miles. At its southern end there are many flat islands, and some shoals; the dangers are, however, generally visible. The water being always smooth, and thick weather seldom occurring, its navigation is rendered easy; it ought not, however, to be navigated at night; and as good anchorages may be obtained in almost any part of it, a safe position may always be selected before dark.

The eastern side of the sound, after passing the North West islets and Grantham sound from the northward, changes its aspect to a low country, with gently undulating hills, which seldom exceed 150 feet in height; and it maintains this character to the southern extremity of the sound. Its shore is indented with excellent harbours and creeks, affording good shelter in all weathers, and fronted with flat islands, particularly at the south-east part.

The western side, on the contrary, is high and bold, forming a singular ridge, varying from 300 to 600 feet, nearly the whole length of the sound, but reft asunder in places, and thus forming harbours. From Bold point, northwards, it is a continuous ridge, lowering gradually to White Rock bay, separated midway by the entrance to Many-branch harbour. These gaps, or fissures, in the southern portion of the sound, form excellent guides to the opposite harbours and islands on the flat side of the sound, by determining their position by bearings from them. Immediately behind this ridge,

* *See* Admiralty chart :—Falkland islands, No. 1,354 *a* and *b*; scale, *m* = 0·32 of an inch.

Hornby mountains extend in a parallel line as far as Hill gap, from whence they take a westerly direction, ranging from 1,800 to 2,000 feet in height.

The ports in Falkland sound need but few written directions, as the shoals are all buoyed by kelp. The chart is the best guide. The harbours on East Falkland will be first described, beginning from the north.

FOUL and MIDDLE BAYS, lying between cape Dolphin and Race point, offer no inducement to enter, being both lee-shore bays, and the first is encumbered with shoals; it has, however, a shallow harbour in its bight, but with a shifting sand-bar, is very difficult to enter, and only fit for small craft.

PORT SAN CARLOS is one of the finest harbours in the Falklands, being capacious, secure, and clear of all danger. Anchorage may be taken either in the bay northward of the long tussac islands, or in the south or east arm; and the San Carlos river is navigable for small vessels 3 or 4 miles up, or for boats about 6 miles. Careening cove, situated 2 miles within the entrance points of the east arm, is a good place for beaching a vessel. Abundance of fish may be caught in the river in the season, and heath fuel may be procured.

PORT SUSSEX, in Grantham sound, is a snug and good harbour for small vessels; the best anchorage is beyond the flat stony point, on the southern side, about 1½ miles up; in 4 or 5 fathoms, stiff mud. It has good water, and is an excellent port for careening or refitting. There is a small kelp patch off the east point of the entrance of the harbour, with 4 fathoms on it, which must be avoided, by keeping near the west point.

BRENTON LOCH, southward of port Sussex, has a narrow entrance and a strong tide, and its navigation is impeded by several rocks and shoals; it is therefore only fit for small vessels or boats. It is admirably sheltered, affords a water communication of 8 miles in length from the centre of the island to the sea, and nearly joins Choiseul sound, from which it is separated by a narrow neck of land little more than a mile in breadth.

NEWHAVEN, on the south side of Grantham sound, is a little port well suited to small vessels, with good anchorage in 4 to 6 fathoms, stiff clay, under a surface of sand. It is open to the north-west, but

little sea sets in. Anchor rather on the western shore, near a small cove, about a mile from the outer point.

CYGNET, KING, WHARTON, and FINDLEY HARBOURS are situated eastward of the Tyssen islands; all are excellent and secure, particularly the three latter, having no shoals in them of any consequence. Cygnet harbour has several small kelp patches which would render it inconvenient for a square-rigged vessel to work in, but it is a capital harbour for small vessels.

There is good anchorage in the bay on the eastern side of Great island in 12 to 15 fathoms; and it is a good starting point for vessels bound to the southward.

RUGGLES BAY lies abreast the Calista islands, and the passage to it is between Ruggles and Wolf islands. Good anchorage may be obtained in Danson and Moffit harbours, and which are clear of danger.

Returning now to the northern end of the sound, we shall briefly describe the several ports which lie along its western shore.

WHITE ROCK BAY is an excellent port, about 2 miles in length, by about one in width, and can be entered or left with any wind, but care must be taken to avoid the rocks off the entrance. Strangers entering it from the northward, with a foul wind, should work up on the eastern shore of the sound, near Race point, until they can weather Tide rock, in the centre of the passage, and then they may stand across into the bay. If leaving the bay, and bound to the northward with a northerly wind, they should stand across, passing either side of Tide rock, and work out on the east shore, in order to keep clear of Sunk rock, and the rock awash off White Rock point. The latter rock is surrounded with kelp, which only shows at slack water, being run under by the tide. With a fair wind a vessel may run in or out close past the large White rock at the extremity of White rock point. Whether bound through the sound, or into White Rock bay, should a vessel have to wait outside for the change of tide to enable her to work to the southward, she should keep a little to the westward of the entrance, under easy sail, where there is scarcely any tide.

MANY-BRANCH HARBOUR can only be sailed into by fore-and-aft craft, in consequence of the narrow and crooked entrance between its high heads, which flaws the wind in all

directions. For large square-rigged vessels, warping or towing must be resorted to in the mornings or evenings, when the wind is generally moderate. It is a good harbour.

PORT HOWARD has also a narrow entrance, but the harbour opens out immediately inside the heads, and a vessel would shoot well in by keeping close round the south head, with the wind to the southward of West. With a northerly wind a square rigged vessel would scarcely succeed; and as there is good anchorage outside in 11 and 12 fathoms, she should wait there for the morning and evening calms. It is a narrow harbour, but very secure, and there is plenty of good fresh water, fish, and geese. The best anchorage for large vessels is just inside the heads, in 4 or 5 fathoms; good holding ground. Williwaws are very strong with winds off the western shore.

There is a station established here for boiling down oil, with a small pier abreast it. A shoal of 14 feet extends off from the pier, to about one-third the distance across the harbour.

SHAG HARBOUR is fit for small vessels only; the gusts of wind down the ravine are very violent, but the holding ground is excellent. There is good anchorage between Swan islands and West Falkland.

FOX BAY* is wild, and exposed with south winds, to a heavy sea; but should a vessel be caught there, there is a good retreat in the North arm, which is quite secure, and where there is a settlement.

The passage to North arm is between the kelp, always visible, which extends from either side; but principally from the eastern. The channel is well over towards Knob island. A secure berth will be found in 3 or 4 fathoms stiff mud, with the first flat island inside the Narrows, bearing South distant about 3 cables. This inner harbour is small, and can only be entered by square rigged sailing vessels, with a fair wind.

Tides.—It is high water, full and change, on the shore at Race point, at the northern entrance of Falkland sound, at 6h. 45m.; the velocity of the tide here is about 4 miles an hour, but in Grantham sound its rate diminishes to about 1½ miles. At the southern entrance of the sound it is high water, full and change, at 7h.

* *See* Admiralty plan:—Fox bay on sheet of ports in the Falkland islands, No. 1,874; scale, $m = 1{\cdot}0$ inch.

The time of high water, full and change, in the harbours in Falkland sound, is given on the chart.

The tides in both entrances of the sound, and between the islands, run from 3 to 5 knots at springs, but in the wider portions they are moderate. The stream of tide at the north entrance makes into the sound about 3 hours before high water on the shore, or about 4 hours at full and change. Among the islands in the south-eastern part of the sound the tides are very irregular in their set and velocity.

There appears to be tide and half tide all through Falkland sound. The flood stream commences by running to the northward when it is half ebb by the shore, and runs until half flood; it then turns and runs to the southward until it is half ebb again. But the tides among these islands require further investigation; Captain Fitz-Roy states that the tide flows into both ends of Falkland sound, and that the two streams meet near the Swan island.

Directions.—The two ports most easy of access in Falkland sound to vessels from East Falkland are, White Rock bay at the north entrance, and Fox bay at the south entrance. There is a little good grassy land near White Rock bay, though quite cut off from the central valley; but Fox bay, though not a good port for large vessels, has a safe anchorage for small ones in the head of the cove in the north-west corner, and a break in the hills there would admit of an easy road to the centre of the island. Vessels bound there from port William would have sheltered anchorages all along the south side of East Falkland and through Eagle passage.

From the northward.—Entering Falkland sound from the northward, steer for Fanning head, the high double peak on the eastern side of the entrance; or, if it be obscured, make a S. by E. course from the Eddystone rock, until within a couple of miles of Race point, when the eastern shore must be kept aboard to avoid Tide rock, and the rocks westward of it; Tide rock is about 5 feet above water, and steep-to, and forms a good guide to avoid the others, by keeping it westward of a S. by W. bearing. The soundings from the Eddystone to the entrance of the sound are fairly regular, over a bottom of fine black speckled sand. Off Race point there is a ledge, which does not, however, extend beyond a cable from the point; and from thence to Fanning head the shore is clear.

If the wind and tide are both adverse, it is advisable in a sailing vessel to keep close under the lee of West Falkland until the tide turns.

From abreast Fanning head, a course S. by W. ¼ W. for 8 miles from White Rock bay will bring the vessel to the North-west islets, which lie off Grantham sound, where the high land of East Falkland terminates. From thence a S.S.W. course for 14 miles will take her abreast of High Cliff island, which, although small, is the highest in the sound, being nearly 100 feet above the sea. It is remarkable for its white cliff, somewhat discoloured by birds, and is first seen from the deck when abreast of Grantham sound; afterwards the low and flat Swan islands, lying in the middle of the sound, will be seen.

Main passage is between High Cliff and Swan islands. After rounding the south-east point of Swan island, borrow on the West Falkland to clear Tyssen kelp patch, which has 4 to 5 fathoms close to its edge. A good leading mark to clear this patch, from the south-east point of Swan island; is a horizontal line of white sand, deposited in the ridge of the West Falkland, bearing S.W. ½ W. This leads 1½ miles north-westward of the patch: and close to patch of kelp, about 30 yards in extent, at 1½ miles from the western shore; with the south extreme of Swan island bearing N. 46° E. 8¼ miles, and West island S. 17° W. The course from between Tyssen patch and the West Falkland, is about S. by W., so as to pass eastward of West island.

Swan passage.—In many cases, however, it may be more advantageous to pass west of Swan island, and the Swan passage is straight and clear, the water is smoother, and near it there is better anchorage than in the Main passage; where, with a strong gale against the tide, there is a heavy race. In both passages, with a foul wind the tide is too strong for a sailing vessel to get through; and in this case, or if waiting for the night, if bound to the southward, the best anchorage is near the north end of West Swan island: and if bound to the northward, in the corner between West Swan island and Hill gap, avoiding the shoals. There is a passage for small vessels only, between West Falkland and West Swan island.

Oberon patch, is about 30 yards long, 10 yards across, and marked by kelp with 10 fathoms around it; and lies about 1½ miles south-westward of Swan passage: from the patch, Hill gap bears

West, and the east end of Swan island N.E. by E. ½ E. The west point of Swan island in line with Poke point N.N.E. ¼ E., leads just clear to the south-eastward of Oberon patch.

Tyssen Island passage.—The passage eastward of Tyssen islands, to the several harbours of East Falkland is clear and good, the narrowest part being to the eastward of Sandbar island; but even there it is rather more than a mile wide, with a good outlet to the Main passage, round the north point of Great island. The only shoals, are the spit extending 4 cables south-east from Sandbar island, and that 2 cables north-eastward from Great island. The tide frequently sweeps the kelp on Sandbar spit, under water, and therefore must be carefully avoided.

There is a channel named Tickle pass, for small vessels, between the south-east part of Great island and the next island to the south-east; it is very narrow, and the tide runs rapidly through, but the least water is 6 fathoms.

From the southward.—Entering Falkland sound from the southward, after passing Wood shoal, which is about 5 miles from the shore of West Falkland, and marked by kelp; keep at a moderate distance from the West Falkland shore: and then the converse of the above directions will be a sufficient guide to any vessel. With northerly and N.W. winds a passage to the northward through the sound, as the water is always smooth, is sooner effected than by proceeding round by the east coast.

Sailing vessels, at either extremity of Falkland sound, intending to proceed to sea, should the day be at all advanced, would do well to anchor for the night and start at daylight; as in that case they would have the whole day to get clear of the entrances, and thus save some anxiety and risk, as the wind generally becomes light after sunset. Good starting ports from the northern entrance, are port San Carlos and White Rock bay; and from the southern, Anchorage bay, on the east side of Great island, and Ruggles bay, but well in the south-east corner up towards Danson harbour, as the ground is hard near the entrance.

We shall reserve the description of ports Edgar and Albemarle till we come round to the southward of the West Falkland, as vessels are most likely to have recourse to them when making this group of islands from the south-westward (*see* page 419–420); we shall now, therefore, proceed to the north coast of the West Falkland.

WEST FALKLAND ISLAND.

TAMAR HARBOUR is the first port on the north coast of West Falkland, westward of the north entrance of Falkland sound, but it is not advisable for any stranger to use it. Tamar pass, the entrance, is very narrow, and a reef extends nearly half-way across from the west entrance point. The kelp on this reef is run under by the extreme strength of the tide, and the eddies are very dangerous. There is also a kelp patch, which shows at slack water in the centre of the channel, between the outer and inner entrance; but the least water found there was 3 fathoms, and the sealing vessels never avoid it. The tide sweeps so rapidly through, that a vessel wishing to bring up in Tamar harbour must haul out of the stream very quickly, to prevent her being carried through into Pebble sound.

Small vessels, when well acquainted with Tamar pass, may find it very useful to pass through it into Pebble sound, if bound to the westward, as it will give them smooth water and good anchorage all the way to port Egmont; but the north-west pass out of Pebble sound is almost equally dangerous, being only a cable wide, with furious tides; and nothing but a small, quick-working vessel should attempt to work through it.

Tides.—It is high water, full and change, in Pebble sound at 8h. 45m.; springs rise 8 feet. Running along the north coast of the islands to the westward (*see* page 406), part of the flood rushes through Tamar and Whaler passes, and part sweeps round the West Pebble islet into Keppel sound, filling that sound, and Port Egmont, 2 hours before it has ceased running to the westward. This latter portion rushes eastward through the North-west pass at the rate of 5 to 8 miles an hour; it sweeps through a part of Pebble sound, meeting the flood-tide that comes in with equal velocity through Tamar pass, and thus causes whirls and eddies in several quarters. The water having attained its height remains quiet only a little while, and then ebbs with similar fury.

From the westward, if bound through North-west and Tamar passes; the time should be chosen to run through North-west pass with the flood, and out of Tamar pass with the ebb.

ELEPHANT BAY.—There is no good anchorage on the north side of Pebble island; but with the wind off shore, temporary anchorage may be found on the west side of Elephant bay, though very much exposed if the wind should haul to the northward. The peaks on Pebble island are the best marks for making out this part of the coast, and are seen very clearly when coming in from the northward.

PEBBLE SOUND, southward of Pebble island, is about 15 miles long and 9 wide; it is full of islands, and has good anchorage in every part of it. The islands are low, and except Golding and Middle islands, are not well supplied with water through the summer. One of the largest streams in the Falklands, the Warrah, runs into the south side of this sound, and at high tide, boats can go up into the fresh water.

Besides Tamar pass and North-west pass, there are two other passages into Pebble sound among the islands—Anxious pass, between Golding and Passage islands, and another very narrow one to the southward of all the islands, close to Creek point; but the approaches to them are so intricate that they are not likely to be used, except by coasting vessels. The chart is the only guide to them, for the kelp, as in the other channels, is always run down by the tides.

PORT EGMONT CAYS.—Two islands surrounded with rocks and kelp to the distance of half a mile, extend 5 miles W.N.W. from the west point of Pebble island, and 3 miles farther westward are Port Egmont cays, of a similar nature.

Wreck and Sedge islands, each about 2 miles in length, east and west, are 4½ miles apart; the space between the islands being thickly studded with rocks and kelp, visible at half tide; the reef also extends nearly one mile northward of Wreck island.

Wreck island is low, and from the southward makes as three low islands; it lies N. by E. distant 6 miles from Elephant point, the west point of Saunders island: it must not be mistaken for port Egmont cays, and should be left to the westward in passing.

Rock.—A rock lies one mile from the south-west end of Sedge island, in the direction of Elephant point.

KEPPEL SOUND is southward of the west end of Pebble island, between it and Keppel island. From Reef point the north-east point of Keppel island, a reef marked by kelp, extends off about

1½ miles; care is required in rounding it. South of Reef point is Committee bay, in which is Cranmar Mission station.*

Anchorage.—The anchorage off the Mission is good, but vessels of 14 feet draught should not go inside a line joining the north and south points of the bay.

Supplies.—Cattle, sheep, rabbits, and vegetables may be procured.

PORT EGMONT, in which was the old settlement, is situated to the southward of Keppel island, between it and Saunders island. There is good anchorage in every part, and the tide is not strong. The north and usual entrance into it, between Saunders and Keppel islands, is nearly a mile wide, and clear of danger; but it would take a very fast-sailing vessel to work through against the tide. The best anchorage is off Old Settlement cove, close to the southward of a kelp patch; or in Sealers cove, a little further to the south-west, where there is a settlement, and which is better sheltered from southerly winds.

Reef channel is a narrow and winding channel leading from the south side of port Egmont into burnt harbour, and through it to the head of Byron sound; but it is not fit for large vessels.

Supplies.—On Saunders island, ducks and geese are plentiful. Good water is readily obtainable.

Tides.—It is high water, full and change, in port Egmont, at 7h. 30m., springs rise 11 feet, making it the best place in the islands for beaching a vessel: Old Settlement cove is well adapted for this purpose.

Directions.—Vessels bound to Keppel sound and port Egmont from the northward, should endeavour to make the high land of mount Harston, on the western peninsula of Saunders island, which will be seen in clear weather long before the low land of Sedge, and Wreck islands, which lie about 6 miles to the northward of it. Passing between Wreck island and Egmont cays, the entrance to port Egmont will be plainly seen. There is a clear passage on either side of Egmont cays; and between them and the entrance of the port, there is no danger, except a small kelp patch off the entrance, which

* *See* Admiralty plan:—Port Egmont, Keppel sound, &c., No. 2,438; scale, m = 1·7 inches.

always shows, about 1¼ miles to the north-west of Gull point. The passage into Keppel sound is between the reef off North point and that extending from Keppel islet; and there is a passage from it into port Egmont, round the south side of Keppel island, which is quite clear of danger, and well marked by kelp; but it would only be used by vessels that had passed through Pebble sound.

RACE ROCKS lie W.N.W., distant 1¼ miles from Elephant point, the north-west extreme of Saunders island; at one mile to the northward of them, is a patch of 4 fathoms, generally marked by a tide rip.

BRETT HARBOUR, on the west side of Saunders island, is of little service; it has a long, narrow entrance, and is shoal, with reefs and kelp patches.

CARCASS ISLAND, the largest of a chain of islands extending in a west-north-west direction, 16 miles from the south-west point of Saunders island, is easily distinguished by the double peak in its centre, 860 feet in height. Off the north-west end lie two islands named the Twins; off the south-east end are the Needle rocks, Low and Dunbar islets; and off the south-west side is Carcass reef, a narrow ridge about 1½ miles in length.

BYRON SOUND, southward of Saunders island, is much exposed to westerly gales, which send a heavy sea up to its head; but there is good anchorage for small vessels in the south-east corner, in the entrance to Hill cove, or the cove itself: but caution is necessary in entering the latter, as a shoal is reported to exist, just inside the two kelp patches, in the centre of the entrance.

Burnt harbour is the only good anchorage in the head of Byron sound, and on the north side there is a good watering place; but a long reef in the western entrance forms two narrow channels, through which a small vessel only can work. There is a very narrow channel round the east end of Burnt island, but it is only fit for coasting vessels.

HOPE HARBOUR is situated at the north-west point of West Falkland. There is a bank to the northward of the entrance, but not less than 5 fathoms could be found on it. Vessels should anchor off Grave cove, on the south side, where there is a good watering place. At the head of the harbour is a stream, in which at spring tides, quantities of fish may be taken

Settlement.—There is a cove on the north-east side of Westpoint island, with a large kelp patch off the entrance, but with not less than 8 fathoms on any part of it. Should a vessel intend remaining for a few days, this cove, in which there is a settlement, is the best place to adopt, as it is not exposed to the heavy squalls off the island which rush up Hope harbour. Rabbits are abundant on the island.

Gibraltar reef is an extensive ledge covered with kelp, extending W. by N. 7½ miles from Westpoint island, with a white rock about 2 miles within the extremity. The tides run directly across this reef, and it is to avoid the risk of being set towards it, that vessels bound to Hope harbour are enjoined to pass to the eastward of Carcass island.

Tides on North coast.—It is high water, full and change, in Hope harbour, at 8h. 10m., spring rise 10 feet; though it is not slack water in the passage till 10 o'clock. The flood tide sets strongly round the west end of Carcass island towards Gibraltar reef, and also through all the passages into Byron sound; but there is very little tide in that sound, nor is a vessel sensibly affected by it until as far west as Carcass reef. There, the flood stream will be found setting very strongly towards Hope harbour, and through it to the southward. The ebb, or eastern stream, sets from Hope harbour towards both ends of Carcass island, and through the channel east of the island, to the northward; but it, likewise, is scarcely felt in Byron sound.

The flood tide sets to the westward along the north side of West Falkland for about two hours after it is high water in port Egmont; the springs run nearly 3 miles an hour off the points and round the islets, causing strong tide rips in heavy weather. After passing the north-west point of Saunders island it runs to the south-west between Carcass island and the islets near it, and through all the channels between Westpoint island and the several Jason islands. Here again the tide and half tide nearly occurs as in Falkland sound, for, meeting the tide wave from the southward round the western islands, the last 4 hours' flood and the first 2 hours' ebb run to the north-eastward.

Directions.—Vessels bound to Hope harbour, from the northward, or to any of the ports to the southward of it, should avoid getting to the westward of Carcass island, as between it and Jason islands are several reefs, the kelp on which is run under by the tide.

But from Sedge, or Wreck island, to the east end of Carcass island, the only dangers are the foul patch, with 4 fathoms water, about half a mile outside of Race rocks, and the patch 3 miles westward of them. With a strong breeze there is a heavy race for nearly a mile west of the 4-fathom patch; but by giving them a berth of a full mile, which all vessels should do, there will be no danger, and a direct course may then be steered for the Needle rocks, or for the eastern end of Carcass island.

The passage eastward of the Needles is the best, as these rocks may be almost touched. From thence to the entrance of Hope harbour there is no danger but what shows well above water; and though vessels may have to make two or three tacks to reach the harbour, it is much better to do this than to pass between the reefs to the north-west of Carcass island, with the chance, if the wind fail, of having to anchor in order to avoid being swept through between the Jason islands and Westpoint island. Nor is there any well-sheltered anchorage there, if it should be necessary to wait for the tide; whereas, by steering for the eastern end of Carcass island, good anchorage will be found in 7 to 12 fathoms in the bay at the eastern end of that island, except with northerly winds, and then vessels may anchor off the bay, on the south side, to the north-eastward of Carcass reef.

CAUTION.—When entering Hope harbour, Hope point should not be passed nearer than a cable, as the kelp is under-run by the tide. No sailing vessel can enter against the tide, except with a good leading wind. If the wind be between N.W. and S.W., it would be useless for her to attempt going out through Westpoint pass, the southern channel, against the tide, as the wind would be so baffling; but she may bring up in the entrance of the cove in Westpoint island, and wait there for slack water.

In passing to the northward through Westpoint pass, it is necessary to wait for the tide, unless the wind should be to the southward of S.W., and even then it may be difficult to get through the northern part of the channel; should this be the case, a vessel ought to bring up in the entrance to Hope harbour, out of the stream of tide, and wait until slack water.

A vessel bound from Hope harbour to the northward should again pass to the eastward of Carcass island and the Needles, and to the eastward of Wreck island; thus avoiding all the reefs and tide rips to the westward and north-westward of the Twins and Carcass

island. Should it be necessary to pass to the westward of Carcass island, the best passage is just westward of the Twins, and southward of the rock which always breaks, lying 2½ miles N.N.W. of Carcass island. Westward of this rock there are some reefs, the kelp on which only shows at slack water, and vessels should cautiously avoid them, as we have no clearing marks to offer.

JASON ISLANDS form a chain extending west-north-westward 38 miles from Hope point, the north-west point of the Falklands. Jason West cay, at the extremity of the chain, is low and less than a mile long; Jason East cay is of a similar nature. Grand and Steeple Jasons are lofty, the former being 1,210 feet in height; inshore of these lie Flat, Elephant, and South Jasons. The latter has a ledge termed Hope reef, extending 4½ miles north-eastward of it; the space between this reef and Carcass island is full of ledges and tide rips. The passages between these islands are little known and should be avoided; those between Flat Jason and Westpoint islands are full of dangers, the tide setting violently across them, particularly Gibraltar reef.

Westward of Flat Jason the passages are clearer. Should the tide, in light winds, set a vessel towards them, by keeping near the middle of the passage she will be taken clear through; but having passed in this manner, between Grand and Flat Jasons to the southward, care must be taken that, on the turn of tide, the vessel is not swept towards the South Jason and the reefs off Westpoint island.

Kelp.—Mr. C. Hansen, master of the schooner *Foam* (1890), reports having passed through a patch of kelp about half a mile in extent; the wind at the time was north-easterly, with a rough sea, but no breakers were seen. From the patch the west end of Steeple Jason bore approximately S.E. by S. ½ S., and its distance 7 to 8 miles. It was estimated to be slack water when the *Foam* passed through, and that the kelp would be under water when the tidal stream (which in this locality attains considerable velocity) is running.

KING GEORGE BAY.—The passage into this bay is quite clear on either side of Split island, and the different openings through the Passage islands are also plainly seen.

Port North is a deep bight on the northern shore of King George bay, with from 10 to 16 fathoms of water, exposed to westerly and south-westerly gales. There is a valley with a good stream at the head of the port. At Pickthorn point, which separates port North

from King George bay, there is good anchorage for small vessels, in Bense harbour between the two Bense islands and the mainland, with a clear passage through it.

Hummock island is the best guide in running up King George bay; its peak forms a cliff on the north side, and slopes off to the southward. Half-way between Bense harbour and Hummock island stands Rabbit island, the west side of which is a high and conspicuous cliff. About 1½ miles to the south-westward is a kelp patch. Between Rabbit and Hummock islands there is a chain of small islets, through which there are three good passages: one, close to the south point of Rabbit island, and the other two, on each side of the islet nearest to Hummock island. They are all clear of danger; but the tide sets rapidly through them, and a vessel should endeavour to keep nearly in mid-channel.

Whaler bay, in the corner northward of Rabbit island, offers a safe and good anchorage, with coves for small craft, and good watering places. There is a narrow channel, between Rabbit island and the main, into this anchorage, but it is scarcely fit for the smallest vessels, being very narrow, and the tide strong. The bay is a good place for fish, a weir having been built at its head by the sealers.

Roy cove.—On the north shore of King George bay, abreast Hummock island, is a very secure and deep creek, named Roy cove, and in which there is a settlement. The rise and fall of tide is 10 feet at springs, so that it is a good place for beaching small craft; and, being deep close to the rocks, it answers also for heaving down a vessel.

Christmas harbour is an inlet at the head of King George bay; and Chartres river, which falls into it, and on which are two settlements, leads to the centre of west Falkland. There are several creeks, and large freshwater streams running through some of the best watered land in the whole group. The entrance to the harbour, near Town point, is about one mile wide, which, after a vessel has passed Hummock island, appears as if covered by scattered houses; this appearance being caused by numerous patches of white sand spread over the side of the hill above the point. Middle island and that eastward of it may be passed on either side; and there is good anchorage inside them, off the mouth of the harbour.

A long narrow reef, covered with kelp, lies in the entrance of the

harbour and forms two channels. The southern is only fit for small craft, there being only 2¼ fathoms at low water on a bank which extends from the west end of the reef to Town point; but northward of the reef the channel is clear, with 4 fathoms, as far as Tide islet, which is small and green, and abreast which is the best anchorage for large vessels. Nearly one mile above Tide islet, where the harbour widens, a bar extends across the harbour, the deepest water over which is 2½ fathoms, near the south shore; but in mid-channel, and from thence to the north shore, there is only a depth of 3 feet; and this shallow water, having a sandy bottom, is not marked by kelp.

The best guide is the kelp on the south shore, which should be left about two cables distant, until the water deepens to 4 and 6 fathoms, whence there is good anchorage for a space of 2 miles with that depth.

Water.—There are several good streams of water in different parts of this harbour; but the easiest for vessels is that marked in the chart, on the south shore, nearly abreast Tide islet.

PASSAGE ISLANDS.—King George and Queen Charlotte bays are separated by a long narrow strip of land, the extremity being named Dunnose head, off which are the four Passage islands. East and Whale, the two eastern passages through these islands, are very good and clear of all danger; the streams of tide set directly through them, turning at about half flood and ebb by the shore. The third or West passage, is narrow, but good with a leading wind. The fourth or False passage is completely blocked by kelp.

Three-quarters of a mile north-westward of Fourth island there is a kelp patch, with 14 fathoms, between it and the island. There is a tide rip here with strong breezes.

Passage islands are steep-to; and there is no outlying danger but what show plainly. Round island, and the Sail rock near it, are good marks for Whale passage, the easiest channel for vessels to pass through; but with a foul wind it would be always necessary to wait for the tide.

Anchorage.—There is no good anchorage near the islands; but vessels detained by a southerly wind, or caught in a southerly gale, might anchor under the lee of Dunnose head near the entrance of Rous creek, a small cove in which there is water for vessels drawing 14 feet; and vessels, if damaged, might safely make for this cove,

and run on the sand at its head; the cove is well sheltered, and the water always smooth. On the south side of Dunnose there is no safe anchorage short of Philomel road, about 10 miles south-eastward of that headland.

QUEEN CHARLOTTE BAY.—This extensive bay, 10 miles wide at the entrance, between Dunnose head and Swan point, is mostly clear of shoals and possesses several good harbours.

Philomel road.—Shallow harbour, in the north-west corner of Philomel road, is the first anchorage on the north side of Queen Charlotte bay, and may be easily known in coming from the westward, by the steep bluff about 2 miles to the westward of it. When abreast this bluff, Green island, which lies off Philomel road, will be plainly seen. This small island may be passed close to, on its south side; and a vessel can then haul up directly into the road, on the north side of which lies Shallow harbour. The chart, and a look-out for kelp, of which there are several patches, will be better guides than any directions. The small islet in the entrance of the harbour may be passed on either side; but if to the westward, take care not to pass too close to Shallow point, on the main land, off which shoal water extends a cable outside the kelp. All other dangers are marked by kelp and can easily be avoided.

There is a narrow channel into Philomel road to the northward of Green island, across the kelp reef which extends a long way northward of the island, nearly joining the kelp off Dick point; but there is a narrow clear channel near the point, through which there is a depth of 6 fathoms, and, with a leading wind, is perfectly safe; but it requires a good look-out from aloft.

Port Philomel.—At the north-east end of Philomel road a narrow channel, nearly 6 miles long, leads to the large land-locked harbour of port Philomel, but the tide is so strong in this channel, that it is hardly safe for any but small quick-working vessels to venture up it, particularly through the Narrows between the two small islands at its inner end; there is, however, a small bay on its north side below these islands, named Halfway cove, in which there is excellent anchorage, out of the tide. Vessels going through should anchor here, even if going up with the tide, and wait till slack water to shoot through the Narrows.

So great is the area of this splendid harbour, that the entrance is not sufficiently large to admit the water as fast as it rises outside;

and consequently it is high water inside 2¾ hours later than in Philomel road and in Shallow harbour, and rises 2 feet less.

When inside the Narrows, there is no danger in any part of port Philomel, except what is marked by kelp; there is excellent anchorage in every part of it, in 7 to 10 fathoms: and in all the creeks there is good anchorage for small craft, in 2 to 4 fathoms. The surrounding shores of the port are well watered, except on the peninsula between the port and Queen Charlotte bay.

In the south-east corner of Symonds harbour, south arm of port Philomel, there is a deep creek, where abundance of fish may be caught by shooting a seine across at high water, about the distance of half a mile from its head, and then waiting for the tide to fall. In Edye creek there is a watering place.

Port Richards, in the south-east corner of Queen Charlotte bay, is a deep inlet, the head of which nearly joins the inner basin of port Edgar; but it offers no very good anchorage, except in a cove on the north shore. It is completely out of the track of vessels.

Antony creek and Carew harbour are two small well-sheltered anchorages on the south shore at the entrance to port Richards, with 12 to 17 fathoms water, except in the southern coves, where there is excellent anchorage in 4 to 7 fathoms, and good watering places.

Vessels requiring anchorage in the south-east part of Queen Charlotte bay, should run into one of these ports in preference to port Richards. Antony creek, the western, is the better, as the water is not so deep as it is in the other, and 10 or 12 fathoms may be found off a cove on the west shore, a little inside the entrance. The land is high on all sides of both creeks.

Double creek, a little to the eastward of Carew harbour affords very good anchorage for small vessels, inside the islets at its entrance.

Gull harbour, on the eastern side of Weddell island is an excellent port, and in which there is a settlement.

Tides.—It is high water, full and change, in Shallow harbour at 9h. 30m., springs rise 8 feet. At Halfway cove, in the narrows leading to port Philomel, it flows till 11.45m., and with a velocity of from 8 to 10 miles an hour.

NEW ISLAND.—Vessels bound into any part of King George, or Queen Charlotte bays, from the westward, should make New island, which cannot be mistaken, as it is the northernmost of the high cliffy islands which form the south-west portion of the Falkland group; and the lofty cliffs at its north-west points are very remarkable. If coming from the south-west, these high cliffs will be the extreme land seen; but from the westward, two small but high islands, North. and Saddle, will be seen to the northward of New island. Between these islands and New island there is a clear but narrow passage, with much kelp: and as the winds are often baffling under the high cliffs, vessels should pass outside North island, which is steep-to.

Ship harbour.—A vessel bound into Ship harbour, on the east side of New island, should haul round the north-east point, and, passing close outside Cliff island, haul up for Small islet at the head of the harbour. There is working room on either side of the islet, and deep water close to the kelp in every part of the harbour. The best anchorage will be found inside Small islet.

Settlement.—There is a settlement at South harbour; but the holding ground there, is said to be hard and indifferent. The best watering place is on the beach at the head of Ship harbour; and it is impossible to find a place better calculated for vessels to touch at for the purpose of procuring a supply, if passing to the westward of the islands. There is, moreover, abundance of excellent peat on the island, and any quantity can be obtained, fit for immediate use, from having been charred by fire. Rabbits are also very plentiful, but permission must be obtained before taking them.

Grey channel, to the southward of New island, is clear of all danger on either side of Seal rocks; but the tides are very strong, and with westerly winds there is a heavy race, so that it would be always better to pass round New and North islands. But vessels going to the southward from Ship harbour with the wind northerly, may run out through Grey channel with a favourable tide.

Tides.—It is high water, full and change, in Ship harbour at 10h. 30m.; springs rise 8 feet; the stream makes to the westward in Grey channel at 7h. 30m.

Between New and Westpoint islands, and in the bays within that line, the tides are not very strong, and except near the points, would not prevent a vessel working either way. They run to the north-east

from half ebb to half flood by the shore, and to the south-west from half flood to half ebb.

Directions.—Though the bays in West Falkland appear so much exposed to westerly winds, there is much less swell in them than might be expected. The tide in the offing, running across the bays from point to point, renders their navigation much easier; while they contain so many well-sheltered harbours and anchorages, that a stranger, if caught in a westerly gale and unable to weather the headlands, need have no hesitation in running up either King George bay or Queen Charlotte bay: in the former, he will find good anchorage inside of Hummock island; and in the latter, by hauling round Swan point, and anchoring under the lee of any part of the east side of Weddell island; or if the weather be quite clear, running for Shallow harbour on the north side of Queen Charlotte bay.

New island might be found most useful to vessels caught in heavy gales to the south-west of the islands, instead of knocking about for days and nights, with the chance of getting on a lee-shore, or being drifted towards the Jason islands. Directly the high cliffs of New island, or Beaver island, are seen, a vessel should bear up, and pass northward of New and North islands, and haul to the southward into Ship or South harbour; the former is preferable, as the holding ground in South harbour is reported to be hard and indifferent. There she might lie quietly, saving all the wear and tear of the vessel and crew, and filling up with water and fuel, and probably obtaining fresh provisions from the settlement; and as soon as the gale is over, and the wind draws round, she can run out either to the northward or southward, and proceed on her voyage.

It might happen that a vessel endeavouring to enter Ship harbour, either from the strength of the gale or from previous damage, might be unable to fetch into safety; in which case she should not hesitate to bear up, and running along the group of islands off the north-west coast of Weddell island, she will soon make out Bald island, and passing it on either side may haul up into excellent anchorage in Bald road, or Chatham harbour.

WEDDELL and BEAVER ISLANDS.—To the southward of New island, there are numerous anchorages in the channels between Weddel and Beaver islands.

Beaver harbour, on the east side of Beaver island, is the best of these anchorages; the chart and the kelp will guide any vessel into

it. The northern entrance to these channels is well marked by two singular rocks, named the Colliers, which look from some directions like vessels under sail. They lie on the western side of the entrance, and may be passed on either side close to. But as all these channels are too intricate to be generally used, little more need be said. The tide sets powerfully through them, and at the southern entrance forms a heavy race. Vessels caught off the southern shore of the group in a south-west gale, and unable to weather Beaver island, might run for either Governor or Tea channels in safety.

Governor channel.—Staats island, between Beaver and Weddell islands, is easily known by the remarkable detached cliff at its south end. Immediately to the westward of this bluff is the entrance to Governor channel, which is clear of all danger, and may be entered during the heaviest gales in safety; and by hauling close round the north end of Staats island, good anchorage, sheltered from every wind, will be found off its north-east point; but the water being rather too deep (15 to 18 fathoms) for merchant vessels to get up their anchors quickly, it would be better for them to run through Governor channel, past Middle island, and then French harbour will be seen a little on the starboard bow.

French harbour.—Into this harbour any vessel may run in safety, furling her sails if possible before she gets in, should it be blowing strong from the westward; and anchoring in its south corner in 5 to 7 fathoms. The only disadvantage of this harbour is, that the channel is rather narrow to work out again, but it is quite clear from shore to shore, and a vessel may tack in the edge of the kelp on either side.

Tea channel, the passage on the east side of Tea island, is also very good, being clear right across; but there is kelp all over the entrance, though it shows only at slack water. The least water in the kelp is 6 fathoms; but there is a heavy race across the entrance, with a southerly gale. This passage may be easily found, when coming from the southward, by the singular high needle-shaped islet or rock, named the Horse Block, which is about 2½ miles south-eastward of it.

In the narrow channel between Staats and Tea islands there is hardly water for a boat at low water; and that to the westward of Governor island is also very narrow and only fit for very small vessels. There is kelp across the entrance, with only 2 fathoms water through it.

Chatham harbour.—Bald road is on the west side of the entrance of Chatham harbour, on the north coast of Weddell island. Approaching it from the westward, Bald island, small and round-topped, with a high cliff on its west side, will be seen lying close off Beacon point, on which there is a hill 275 feet high. A vessel can run between this point and Bald island, and haul up into good anchorage under Beacon point, in Bald road.

If a vessel pass eastward of Bald island, she must give it a good berth, to clear a detached kelp patch which lies three-quarters of a mile to the eastward of it, and she may then either anchor in Bald road, or run up to Chatham harbour. All the dangers there are marked by kelp; and the best anchorage is in Elephant cove, where there is a good watering place.

Tides.—It is high water, full and change, in Chatham harbour, at 9 h.; springs rise 8 feet.

SMYLIE CHANNEL.—South harbour.—There is a safe entrance through this channel into Queen Charlotte bay, between Weddell island and the main. Cape Orford, the south entrance to this channel, is cliffy, with Orford hill within it, about 325 feet high; a small island named the Sea-Dog lies off it. There is a heavy race in Smylie channel with westerly winds, when the tide is running out; and the kelp, which extends nearly across the west entrance, shows only at slack water; but under the kelp there is a depth of 4 fathoms. The deepest water is on the Weddell island side of mid-channel. When inside this entrance, two openings will be seen on either side of Dyke island; the northern one leads directly into Queen Charlotte bay; and the other into South harbour, in every part of which there is good anchorage for large vessels.

The reefs at the east entrance of Smylie channel always show, and can be passed on either side in safety; but the best passage is that close to the shore of Weddell island.

Stop cove.—Good anchorage may also be found on the north side of Smylie channel, in Stop cove, which is formed by a low green tussac island, joined to the shore by a spit, dry at half tide. Vessels bound to the westward through Smylie channel may anchor in this cove, to wait either for the tide or daylight; and it is the best anchorage in any part of the channel.

Penguin cove.—There is a good watering place in Penguin cove, about a mile north of Stop cove; and geese are abundant.

New Year cove, on the eastern side of Weddell island, just within the eastern entrance of Smylie channel, is an excellent port.

House cove.—There are some coves on the eastern side of Dyke island with good watering places, but they are out of the way of vessels going through Smylie channel. One of these, House cove, is an excellent place to lay a small vessel ashore, the rise and fall of tide being 10 feet.

RODNEY COVE is the only place of shelter on the south side of the West Falkland, between cape Orford and port Stephens. It is a secure and safe anchorage, but can only be entered with a leading wind. The kelp extends nearly across the entrance; but there is water in mid-channel for large vessels. A small lane of clear water, near the middle of the kelp, shows the channel; and when inside the kelp, anchorage may be found in any part of the cove in 3 to 8 fathoms.

PORT STEPHENS is the first port to the westward of cape Meredith, and may be easily known by reference to the view on the plan.* The land is very remarkable; Bird island, Castle rock, and Stephens bluff, a remarkable cliffy head, lie to the westward of the port; and there is a notable hill named the Three Crowns, 480 feet high, with three distinct masses of bare rock, to the south-eastward.

The entrance, 400 yards wide, is easily seen, and lies between two cliffy points, 60 or 70 feet high, named Pea point and Cross island.

A small rocky islet lies north-eastward of Stephens bluff, off which there is kelp, and a rocky bottom, for nearly half a mile in the same direction.

Settlement.—Within the entrance, the port is about 7 miles in length and from one to 2 miles in width. Anchor inlet lies N.N.E. of the entrance, and Hoste inlet in the northern part of the port. At the western extremity, at the head of a small inlet, is the settlement, consisting of red tiled buildings, and a flag staff.

* *See* Admiralty plan:—Port Stephens, with view, on sheet of ports in the Falkland islands, No. 1,874; scale, m = 1·0 inch.

Communication is kept up with Stanley harbour by means of a steamer or schooner, which conveys the mails and supplies.

Anchorage.—There is good anchorage off the settlement in 13 fathoms, with Stephens peak about S. by W.; and outer east point of the inlet E. ½ S.; small vessels may go nearer the settlement.

Also, in Anchor inlet, north of the entrance to the port, there is snug anchorage in 9 to 13 fathoms, mud; off the sandy beach on the eastern side.

Kelp extends off both points of the inlet, but the water is deep to the edge of it. There is also a fair anchorage to the south-east of the rocky islets.

Tides.—It is high water, full and change, in port Stephens at 7h. 45m.; springs rise 7 to 8 feet.

Directions.—In making port Stephens from the north-westward, Castle rock, and the outer part of Stephens bluff have a very similar appearance. When running for the port, vessels may pass tolerably close to them, as they are steep-to; but if there be much swell from the southward, it would be better to open the entrance well out before standing in.

From abreast Stephens bluff, the entrance must be approached bearing North, to avoid the foul ground north-east of the bluff, and which will lead clear of all danger. Some stalks of kelp may be seen, but they can be avoided by keeping a little more to the eastward. The tide seldom runs more than 2 miles an hour.

Within the entrance, the two rocky islets must be left on the starboard hand, when course may be shaped for Anchor inlet, or the settlement. The dangers northward of Knoll island are all marked by kelp.

Vessels not wishing to enter the port may find a convenient stopping-place between Pea point, the west point of entrance, and Stephens bluff. Steer as if intending to enter the port, and when about a quarter of a mile from Pea point, haul to the westward, keeping near the north shore until abreast Stephens Bluff island, and anchor where most convenient; the bottom is sandy, mixed with mud, and the depth from 6 to 10 fathoms. This is a convenient place for vessels anchoring for a night, as it is easier left than port Stephens. In entering it will be necessary to pass through some straggling stems of kelp, but the water is deep.

A good anchorage may also be found by passing between Cross island and the islets south-east of it; but it is difficult to leave, as westerly winds blow directly into the entrance, and it is too narrow for a vessel to beat through.

Port Stephens is not easily quitted, excepting with a fair wind; particularly after a breeze from the southward, as then a heavy swell sets in.

ARCH ROAD, the next port to the eastward of port Stephens, is a good anchorage, and much frequented by whaling vessels. It is formed entirely by the Arch islands, which are remarkably rugged, with upright light-coloured cliffs, and take their name from a natural archway at the south-west end of the south island. The road is entered by passing to the westward of the two large islands, between them and Clump island. This anchorage, on account of the more convenient depth for anchoring, is preferred to that of port Albemarle. Vessels lie here well sheltered from the swell, but they feel the full force of the wind.

A shoal of 2½ fathoms, about one mile in extent north-east and south-west, which breaks in heavy weather, and is seen by the kelp when not under-run by the tide, lies about S.S.E. ½ E., distant nearly one mile from the south Clump island.

PORT ALBEMARLE.*—Albemarle rock is a good guide to port Albemarle. It is bold, upright, about 150 feet high, saddle-shaped at the top, and whitened at its sides by innumerable birds which frequent it. It bears S.E. by E. ¼ E. distant 1¼ miles from the north-east end of the Arch islands, and may be passed on either side at the distance of a quarter of a mile.

To enter this port, vessels may pass on either side of the Arch islands, care being taken to avoid the patch of 2½ fathoms, south-eastward of Clump island. The water in Albemarle road is inconveniently deep, but free from danger, and leads to a good anchorage in Lucas bay in 10 fathoms, to which large vessels may work up with ease after rounding Lucas point.

Albemarle harbour is 5 miles north-west of the road, at the head of North-west arm, with depths of from 10 to 12 fathoms. The arm being only from 2 to 3 cables in breadth would be difficult to work through. There is a settlement in the north islet of the harbour.

* *See* Admiralty plan :—Ports in the Falkland islands, No. 1,874 ; scale, m=1·0 inch.

CHAFFERS GULLET* lies close to the northward of port Albemarle, and its deep water branches extend several miles inland; but it is too narrow to call for a more detailed description at present.

From Arch islands to port Edgar the coast is bold and clear, and the rate of the tide does not exceed 2 miles an hour.

WOOD SHOAL, is situated about 9 miles S.E. by E. from the entrance to port Edgar. The shoal is nearly circular, with a diameter of about 2 miles. The soundings on its northern edge are regular, from 13 to 16 fathoms, with straggling kelp beyond. The reef is well marked by thick kelp, and the least water found was 11 fathoms; but having been seen to break during southerly gales, it may be much shoaler in some places; and as thick patches of kelp always indicate danger, it had better be carefully avoided.

At times the kelp is not seen in passing, when probably it is underrun by the tide.

PORT EDGAR* is easily known, after making cape Meredith or the Arch islands; and it is the nearest opening westward of Fox bay, about 5 miles distant. The entrance, a little more than a cable across, is between two bluff heads, and, with the wind northerly, it would be difficult for a square rigged vessel to enter without warping.

As a secure harbour, port Edgar is second to none. It is about 7 miles in length, by one mile in width, with anchorage in any depth under 17 fathoms. The inlet, westward of the entrance, will accommodate the largest vessels.

There is a settlement at the head of the creek, on the south side of the entrance to the inlet.

Port Edgar has a great advantage over all the harbours to the northward and westward of it, having a moderate depth of water for some distance outside. When blowing hard from the northward or westward, so as to prevent a vessel from entering, an anchor may be dropped in from 15 to 20 fathoms sandy bottom, anywhere under the ridge that forms the western point of entrance, and which extends N.N.W. and S.S.E. about 4½ miles. With these winds the water outside is quite smooth; and if they should veer to the southward,

* *See* Admiralty plan :—Ports in the Falkland islands, No. 1,874; scale, *m*=1·0 inch.

so as to make it necessary to weigh, the port will be open to leeward.

Tides.—It is high water, full and change, at Port Edgar, at 7h. 15m., springs rise 6 feet. There is but little tide at the entrance.

Directions.—When the wind is between West and S.W., it is very baffling and squally, therefore good way should be kept on the vessel, when entering port Edgar, and the western shore well closed, even to the edge of the kelp, where there is a depth of 24 feet, a few fathoms distant from the rocks. By this means, a vessel may shoot in past the heads, so as to get the steady breeze inside. When once within the heads, the harbour opens out suddenly. The rocks on both sides the entrance are bold-to. There are from 10 to 12 fathoms in mid-channel.

This port should not be quitted after a southerly gale without a commanding breeze, as the swell is heavy without the heads, and continues for some time. But, as northerly winds generally follow a breeze from the southward, there is little fear of a vessel being detained.

BURDWOOD BANK, situated about 90 miles south of Falkland islands, is about 210 miles long east and west, and 60 miles across the broadest part (western), with general depths of 60 to 80 fathoms, bottom chiefly coral, and 25 to 30 fathoms near the middle. There are depths of 133 to 195 fathoms close to its southern edge and 103 to 117 fathoms close to its northern edge.*

ISLANDS AND ROCKS SOUTH-EAST OF FALKLANDS.*

SHAG ROCKS.—These rocks, assumed to be in latitude 53° 48′ S., longitude 43° 25′ W., were reported to have been seen on April 2nd, 1855, by the master of the ship *Ellerslie*, who described them as showing as three separate peaks about the height of a ship's mast above the water. More recently Captain C. Vaux, of the ship

* *See* Admiralty charts:—South Atlantic, No. 2,202*b*, and 2,203; also Pacific ocean, No. 2,683.

Epsom, bound from Callao to Ceylon, sighted three rocks which he made to be in latitude 53° 40′ S., longitude 43° 30′ W.; they appeared to bear North and South from each other about half a mile apart, pinnacle in shape, black, and about 150 feet high. These rocks, which at one time were reported to be awash, may have given rise to the supposed existence of the Aurora islands.

SOUTH GEORGIA,* lying between the parallels of 54° and 55° S. and between the meridians 35° 50′ and 38° 15′ W., was discovered by Antony La Roche in 1675, and was explored, and taken possession of by Captain Cook in January 1775; in March 1823 it was visited by Mr. James Weddell, Master, R.N., and in August 1882, the German expedition for observing the transit of Venus, conveyed by His Imperial Majesty's ship *Moltke*, landed here, and remained until September 1883, when they were taken off by the *Marie*.

South Georgia is about 100 miles in length in a N.W. by W. ½ W. and S.E. by E. ½ E. direction, and twenty miles greatest breadth. The island is high and appears to consist of almost perpendicular mountains, and usually covered with ice and snow to the water's edge. After a mild winter, the lower hills near the coast appear of a light brown colour, free of snow. The shores, especially the northern, are deeply indented, reducing the island in one place to half a mile only in breadth; but the large quantity of ice in the bays must render them inaccessible during the greater part of the year, and dangerous for a vessel to lie in on account of the breaking of large parts of the ice cliffs which, during Captain Cook's visit, broke off and floated to sea. Also the *Moltke*, in passing Possession bay, observed two massive glaciers fall into the sea; many icebergs were close to the coast and some aground in the bays. The *Jane*, and *Beaufoy*, in the month of March, anchored in Adventure bay on the south-west side of the island, in 7 fathoms clay, and "the crew after having suffered much from cold, fogs, and wet during the two months they had been navigating the southern ocean, fed plentuously on young albatrosses and greens, which, although bitter, are very salutary being an excellent anti-scorbutic.†

The climate of South Georgia must always cause it to be almost an unknown land, for an everlasting winter reigns over it: even in

* *See* Admiralty chart:—South Georgia, and plan of Moltke harbour, on chart South Atlantic, No. 2,202 *b*.

† Captain Weddell's "Voyage towards the South Pole."

summer, the valleys are covered with frozen snow of a great depth, the only parts in which vegetation appears being on the north-east side during the summer, when some of the snow becomes melted: the south-west side being deprived of the sun's rays by the great height of the mountain, is always frozen.

The inner parts of the island are desolate and almost entirely barren, the only vegetation seen was a coarse strong-bladed grass growing in tufts about two feet high, wild burnet, and a plant like moss which sprang from the rocks.

Soon after Captain Cook's exploration, the island was much resorted to for the purpose of seal-hunting and the capture of sea elephants for their oil, but these animals now appear to be almost extinct.

Islets.—There are numerous off-lying islands, the most important of which are the Clerke rocks lying E. by S. 40 miles from the south-east end of the island. Cooper isle at the south-east end is a rock of considerable height, and one mile from the main. About 8 miles N.N.E. of Cooper island, and about the same distance off shore, is a reef of rocks. Off cape Disappointment, 15 miles south-west from Cooper isle, there are three or four small isles, the southernmost named Green island is low and flat, and lies 3 miles from the cape. Wallis isle near the western extremity of South Georgia is a high rock of moderate extent. No rivers or streams were seen.

Cumberland bay.*—The anchorage in the south-east corner of Cumberland bay (in 19 fathoms), was found to be unsafe on account of drifting ice, and the vessel during a violent snow squall, having dragged into deep water, proceeded for Royal bay, where, after some delay, caused by continued bad weather, she anchored on the 21st August.

Between Cumberland and Royal bays, a large and well sheltered bay with some low rocky islets in the entrance, was found to exist, but in the inner part an iceberg was aground, and thus blocked the entrance.

Royal bay.—Moltke harbour.—This anchorage is in a small bay now named Moltke harbour, on the western side of Royal bay, in lat. 54° 31′ S., long. 36° 6′ W., and being found to afford fair landing, with comparative freedom from glaciers, was chosen as a

* The remainder of the information on South Georgia is from the German transit of Venus Expedition of 1882.

site for the observatory. The bay is about 1½ miles across the entrance, one mile deep, is fringed by kelp on either side, and has depths of 22 fathoms, decreasing gradually towards the head of the bay. Rocks and sunken rocks, marked by heavy breakers, extend south-eastward about half a mile from the north side of Royal bay. No shoals were found outside the kelp. The harbour is difficult to distinguish on account of the low land on its north side, but from off the entrance, two glaciers will be observed in the bight; on the western side of the smaller one is a black rock about 80 feet high, which stands off well against the snow-covered mountains. Coming along the shore, capes George and Charlotte are conspicuous, the former on a north-west bearing appears as a projecting rock, with a saddle behind it; the latter has three conical hills; from abreast, they resemble many other points along the coast.

In Moltke harbour the soil is found to be covered with a layer of peat over clay, and subsoil of black sand and gravel. Tussock grass was found growing under the snow, and with the exception of moss, was the only vegetation seen.

Seals, penguins, and many kinds of sea birds were numerous; and of eatable kinds, duck and pigeons were found.

Directions.—Anchorage.—Approaching from the north-west, steer for cape Charlotte, and after having passed the breakers at a distance of 1½ miles, steer for the land between the two glaciers. When Moltke harbour opens out on a W.N.W. bearing, steer for its centre, and anchor in 12 fathoms, about three-quarters of a mile from the head of the bay.

The anchorage is sheltered from E.N.E. through north and west to W.S.W., but is open to the other quarters, particularly from E.N.E. to E.S.E. Strong westerly winds blow here in squalls of hurricane violence; setting in from S.W. and shifting to N.W. S.E. winds send a heavy sea into the bay, and it is recommended that when these winds blow—and they seldom last more than 24 hours—vessels should put to sea.

In calm weather, with an easterly swell, drifting ice is brought into the bay by the flood tide.

Tides.—It is high water, full and change, at Moltke harbour at 7h. 20m., tides rise 2½ feet, but are much influenced by the wind; the streams set fairly in and out of the bay at the rate of half a mile an hour.

In the offing the current was observed to set E. by N. to N.E., a half to one mile an hour, and close to the coast it set E.S.E.

SANDWICH GROUP.—These islands which were discovered by Captain Cook, in 1775, consist of a group of eight, namely, Zavodovskii, the northernmost, Visokoi, Lieskov the most western, the two Candlemas isles, Saunders, Montague, Bristol, and Southern Thule; also two islands, each volcanic, and consisting of barren black rocks, some of which are of great elevation, and are covered with ice and snow. Zavodovskii is in latitude 56° 18′ S., longitude 27° 30′ W., the islands occupying a space of 200 miles in a north and south direction.

In the end of February 1823 Captain Morrell of the *Wasp* while sailing round this group of islands, observed nine active volcanoes, six of which were lofty, and three, including the western of the two Candlemas islands, were low, and nearly level with the water's edge. Bristol island has a lofty peak named Freezeland, shaped like a sugar-loaf. Southern Thule consists of two islands of vast height, and in the north-east side of the western isle, Captain Morrell discovered a good harbour.

THE SOUTH SHETLAND islands, most of which are volcanic, were discovered by Mr. W. Smith in the brig *Williams* in February 1819, when on a voyage from Buenos Aires to Valparaiso and standing far to the southward. They were examined by Captain Bransfield in 1820; and were visited by various navigators up to 1843, when they were examined by Captain J. Ross; from whose collective observations their position and configuration have been obtained.*

The most northerly and best known of these islands are Clarence, the easternmost, Elephant, the northernmost, King George, Nelson, Roberts, Greenwich, Livingston, Deception, Snow, Low, and Smith islands. They extend in a north-east and south-west direction about 260 miles, are separated by deep channels and surrounded by innumerable islets and rocks. Sugar loaf island, which is about a mile distant from the east side of Clarence island, is in latitude 61° 15′ S., longitude 53° 50′ W., and as far as can be at present ascertained is the most eastern part of the group; the most northern rock, lying off Elephant island, is placed in latitude 61° 0′ S., longitude 55° 40′ W.; and the most westerly rock in this range, Williams rock, to the south ward of Smith island, in latitude 63° 17′ S., longitude 63° 0′ W.

* *See* Admiralty Ice chart, southern hemisphere, No. 1,241.

All the northern parts of the coasts of the south Shetlands abound with islets, rocks, and breakers, while the southern coasts are entirely clear of these dangers; in the early part of the spring the southern sides are blocked with ice, which comes from the main land adjacent to the southward; this main land is bordered by rocks and breakers.

The interior of the south Shetlands consists of high hills or mountains; Clarence and Smith islands being over 4,000 feet in height. The islands, all the year round, are almost entirely covered with snow, and only after midsummer (in January) a few tracts which are free from snow, are overgrown with lichens and mosses, in some place supplanted by a sort of straggling grass. A species of coal was found, which burnt very well. The summer may be compared to a dull November in England, and the winter as one long, starless, and desolate night. A perpetual gloom prevails which the sun seldom or never penetrates, so as to be distinctly seen for many hours together; fine days are few and far between; the atmosphere is laden with vapour, causing everything to be damp and humid, but the climate may be considered as healthy. Sea fowl, such as the albatross and penguin, are numerous, as were also seals before their extermination by seal hunters.

Bridgman island is near the centre of the Shetland group, in latitude 62° 10′ S., longitude 56° 40′ W.; it is of volcanic production, small, nearly circular, 400 feet high, and partaking of the form of a sugar-loaf. Captain Weddell when passing within 200 yards of it in 1822, observed smoke issuing from the fissures of the rock.

Deception island the east point of which is in latitude 62° 56′ S. longitude 60° 30′ W., is the south-west island of the main group, and lies 100 miles west of the northern point of Louis Philippe land. This island which is nearly circular, about 7 miles in diameter and ice-bound, is well entitled to its name, and is a very extraordinary production of nature: it is a volcanic formation, its shores on either side having pumice-stone with other substances indicating its origin; there are also several hot springs, some of which are of a temperature sufficient to boil an egg. Streams of water at a temperature of 140° to 160° Fahr. were also found issuing from the side of the hills in some places, and running into the basin the water of which was scarcely above the freezing point.

The land is high and bold on every side, particularly the north which has an elevation of 800 feet; there is a narrow opening of about a cable wide on the south-east side leading into

a capacious basin named port Foster, which is the best harbour of those known in these islands, it is about 5 or 6 miles across and 97 fathoms in depth. At the entrance the soundings are 3, 4, and 7 fathoms water, increasing very rapidly as the basin is entered to 18, 27, 32, and then no bottom at 60 fathoms. On the north-west side of the basin, N.W. by W. from the entrance, there is a fine cove capable of containing several vessels, in about 4 or 5 fathoms water, clay bottom.

Deception island was one of the pendulum stations of Captain Foster in the *Chanticleer*, in January 1829, and it is generally supposed that this basin was formerly the crater of a volcano, and that the sea has found its way into it by washing out the narrow passage by which the *Chanticleer* entered. How long it had been resorted to by sealing vessels is unknown.

The examination of the basin by the officers of the *Chanticleer* was attended by considerable difficulty, owing to the small ashes and dust which were carried into it from the island. Not the slightest verdure exists on the island ; seals, sea leopards, and penguins were seen.

Smith island, lying 40 miles west of Deception island, was first visited by Captain Weddell, who described it as the highest and most forbidding of all the south Shetlands. Captain Foster in the *Chanticleer* visited this island in January 1829, and found it covered with snow, excepting on the sides of the precipices and on the faces of the rocks, where it could not lie, and these from their black appearance presented a striking contrast with the high snow-clad land. The highest point of Smith island, Captain Foster named Mount Beaufort, but it is now more generally known by the name of Mount Foster, and calculated to be 4,304 feet above the sea level ; its summit is in latitude 63° 2′ S., longitude 62° 47′ W.

LOUIS PHILIPPE and JOINVILLE LAND.—Southward of the south Shetlands and separated by a broad and deep channel, named Bransfield strait, are Joinville island, Louis Philippe land, Trinity land, Hoseason island, Graham land, &c., of which very little is known, except that the land is very high, mountainous, and barren, and generally covered with snow ; all this land lies to the south and west of the south Shetlands. In 1821, Powell discovered Trinity land, south of the Shetlands ; Palmer, an American, discovered a coast-line west of Trinity land ; and the Russian navigator, Bellingshausen, discovered Alexander's land

south-west of Palmer's land. In 1823, Weddell tried to find land, east of the meridian of the Shetlands; he did not find land, but succeeded in advancing as far south as lat. 74° 15′ S., where he found a sea clear of ice.

Louis Philippe and Joinville land which forms the eastern part of the southern side of Bransfield strait, was discovered by Admiral D'Urville, of the French navy, in 1838, and was visited and examined by Captain Ross in 1843. "On the 27th February 1838," remarks the Admiral, "after a long stretch towards the south through much ice, we came upon these mysterious lands; and in spite of the complicated obstacles against which we had to contend, both on account of the continued bad weather, and from the fog and ice, in the space of about eight days we succeeded in tracing their outline, for a distance of about 120 miles between 63° and 64° south latitude. The land which is crowned with immense peaks, is covered with perpetual snow of an unknown depth. Were it not for the black rocks rendered visible by the melting of the snows which form their limits on the coast, one would scarcely be able to distinguish them from the numerous fields of surrounding ice."

Biscoe islands.—Adelaide island, discovered by Captain Biscoe in February 1832, is one of a chain of islands lying in a north-east and south-west direction, fronting Graham's land, and named Biscoe islands. The island is about 8 miles long, east and west, and its centre is in latitude 67° 13′ S., longitude 68° 15′ W. It has a most imposing and beautiful appearance, with one high peak shooting up into the clouds, and occasionally appearing both above and below them. A lower range of mountains extend about 4 miles from north to south, having only a thin covering of snow on their summits, but towards their base buried in a field of snow and ice of the most dazzling brightness, which slopes down to the water, and terminates in a cliff 10 or 12 feet high, riven and splintered in every direction, to an extent of 200 or 300 yards from its edge.

At a distance of 3 miles no bottom was found at 250 fathoms, and round all the Biscoe islands the depths are considerable. One named Pitt's island in latitude 65° 20′ S., longitude 65° 38′ W. has many bays, and forms with the main land behind, a good harbour for shelter. No living animal was found on any of the Biscoe islands, not even birds, although only a few miles to the northward they were numerous.

Tides.—The following remarks are from information supplied

by Captain Robert Fildes of Liverpool. "On the north coast of the south Shetlands the tides are very irregular, being sometimes high water for 24 hours together; at others it flows tide and half tide, and remains for about 3 or 4 hours high water, and then ebbs again, though there is in general one flood and one ebb every 24 hours. Gales of wind sometimes elevate the tide much above its natural level, which may account in some measure for many skeletons of whales which lie in some places at least 12 or 14 feet above high-water mark, and many yards from the sea-shore. In Blythe bay, Desolation island (latitude 62° 26′ S., longitude 60° 12′ W.), an easterly gale will raise the water considerably above common height; and the brig *Lady Troubridge* that drove ashore on Christmas day, 1820, was found in the next season forced up nearly high and dry. Near the entrances of Bransfield strait the tidal streams run very strong, and in various directions, which makes the navigation in light winds both unpleasant and dangerous. The flood stream on the coast sets to the eastward.

"In a south-west gale, also in an easterly gale, the current has been found to set directly to windward, at a distance of fully 3 miles from the coast. During an easterly gale, the ship *Indian* drove 30 miles to the westward; and the brig *Williams*, though lying to, drove up 20 miles to the eastward, and directly to windward during two-thirds of the distance; which evidently showed that the two vessels had received the impulse of two contrary streams.

"From the observations which have been made, it is inferred that the flood and ebb streams in moderate weather run eastward and westward for a distance of about 6 miles from the outer points of the land, taking the sweep of the bays; but, it must be understood that under certain conditions the streams run much longer both ways, and with more velocity than at other times: the distance from the coast also varies. Outside these limits the current has been found to run with the wind at the rate of a mile an hour.

"From the above remarks, it clearly shows, that it is at present not easy to give a satisfactory account of the tides so as to reduce them to anything like a regular theory. One circumstance, however, may be worthy of notice: fragments of the wrecks of the *Cora* and *Clothier* were all invariably drifted to the westward, cape Shirreff and the north beaches being scattered all over with them, but not one single particle was found to the eastward; the *Cora's* remains were easily identified, being either cedar or mahogany. South-eastward of Joinville island, it is pretty generally admitted, that the

motion of the water is, on the contrary, towards the eastward and carrying with it large quantities of ice."

Winds.—The same authority remarks: "Nearly all the misfortunes that have happened in south Shetland have been in gales of wind from the eastward, which frequently prevail here, and blow with tremendous fury, generally accompanied by heavy falls of snow. No less than seven vessels have been lost, and all with easterly gales, except the *Clothier*, an American, which struck on a sunken rock. In the years 1820, 1821, and 1822, four-fifths of the gales were from the eastward, though we had all looked for harbours sheltered from the westward, under the impression that we should have most to fear from that quarter.

"In fine weather the winds from S.W. and N. E. are about equal in duration, not keeping long in either quarter. Indeed with few exceptions the winds blow along the land, which renders this coast far less dangerous when under sail than it would otherwise be. The south-westers here, very much like the north-westers at home, are attended with a fine clear sky, and generally sweep away all the fog and sleet of the light north-westers. In two seasons, I recollect only one gale from the north-west, which was very heavy. I was then at Blythe bay, and it was perfectly smooth, though the sea outside was in a manner overwhelming.

"It would appear if a parallel may be drawn from these two seasons, that gales of wind on the land are very unfrequent. I have noticed that the wind on the land is generally light with thick dirty weather: however, the gales of wind after the middle of February, begin to increase in strength, and it is then not worth while remaining on the coast. Were I bound round cape Horn, and to meet with adverse winds, I would not keep hugging the wind, and tacking with every slant, but run a little free, and keep my reach to the southward, when I should be sure not to be long without an easterly wind, and gain such an offing from the western part of Tierra del Fuego, as to make for me a south-west wind a fair one." The seamen should of course study the ice-chart in adopting this route.

On approaching south Shetlands from the northward, Livingston or the main island, will appear in mountains of vast height, and covered entirely with snow, the bases of them terminating in perpendicular ice cliffs. On this side of the group in latitude 62° 20′ S., longitude 59° 50′ W. is a small isle named Table island, which is by far the most remarkable hereabout, and will always be an infallible

mark for anyone approaching, as it is not possible to mistake it for any other land. Its top appears perfectly level, and its sides resemble a wall; in the upper part of its north-east end is a chink or division, which from some directions may be seen. All strangers are recommended to make this their landfall, particularly in the early part of the season, for then the land is not so easily made out on account of its snow covering, and which may at times deceive those best acquainted.

THE SOUTH ORKNEYS ISLANDS, were discovered by Captain Powell in the sloop *Dove* in 1821; they were subsequently visited by Mr. Weddell in 1823, and by Admiral D'Urville in 1838. They consist of two principal islands, named Laurie and Pomona or Coronation islands, and a number of smaller ones. Cape Dundas, the east point of Laurie island is placed in latitude 60° 54′ S., longitude 44° 20′ W., thence the island extends about 25 miles to the westward and is about 8 miles in breadth. The summit is 3,083 feet above the sea. Northward of the western end of Laurie island are several smaller ones, the outermost named Saddle island on account of its appearance, is estimated to be about 1,500 feet in height. The passage between Coronation and Laurie islands is divided into two straits by a group of islands named after the discoverer, the eastern one called Washington strait and the western Lewthwaite.

Coronation island extends in a north-west and south-east direction about 38 miles and is about 12 miles broad; the highest peak in this island attains an altitude of 5,397 feet; point Penguin its north-west point is in latitude 60° 33′ S., longitude 46° 40′ W. Westward of this island are numerous rocks, and nearly midway between it and the Inaccessibles, one named Despair rock. The Inaccessibles lie 25 miles to the westward of Coronation, the summit of the highest is 337 feet above the sea.

Mr. Weddell remarks that the "South Orkneys are if possible more terrific in appearance than the South Shetland. The tops of the islands for the most part terminate in craggy towering peaks, and look not unlike the mountain tops of a sunken island." The loftiest of these summits towering up to a point he named Noble peak, which in clear weather is visible at a distance of 45 miles.

CHAPTER XII.

CAPE ST. ROQUE TO THE AMAZON RIVER.

Variation in 1893.

Cape Calcanhar-	- 14° 0′ W.	Maranham - -	- 7° 0′ W.
Ceará bay - -	- 12° 20′ W.	Tijoca point (Pará)	- 4° 30′ W.
Paranahiba, river entrance - -	- 8° 20′ W.		

All the north coast of Brazil, with the exception of the province of Ceará, is low, and formed of sand-hills from about 150 to 250 feet high. These hills are of very similar appearance, interspersed with small red cliffs and also with patches of mangroves, situated on the banks of the rivers, which they often serve to indicate; the vegetation on the east banks, if any exist, is covered by the sand that is blown westward by the wind. The direction of nearly all the rivers as they approach to the sea is to the north-east; their entrances are obstructed by sand-banks which, with the exception of the Tutoia, will not admit of navigation by vessels drawing more than 12 or 13 feet, and on which there is always a heavy surf. It is stated that many of these rivers are gradually filling up, and admit only small coasting vessels. A large part of the coast is imperfectly surveyed.*

Tides.—The tides are regular upon all this coast and are stronger in the west than in the east. The flood sets to the westward, and the ebb to the eastward. The tidal streams are stronger close to the land and in shallow water; the distance to which they extend depends much upon the direction of the wind and the depth of water, but in general their influence is not felt more than 6 or 8 miles from the coast; except at Maranham, where there exists a large bay encumbered with shoals, and where the tides in some of the channels run with great strength.

* *See* Admiralty charts:—Maranham to Pernambuco, No. 528, $m = 0{\cdot}05$ of an inch; and Rio Mossoro to St. Roque channel, No. 888, scale, $m = 0{\cdot}4$ of an inch.

The COAST from cape Calcanhar (Touro point) trends in a west-north-west direction for about 31 miles to Tres Irmaõs point. The coast is low, interspersed with small villages and groups of cocoa-nut trees, but with few other distinguishing objects, and is skirted at the distance of about one mile by reefs, some parts of which at times uncover. The depth of water between the inner and outer reefs varies from 4 to 9 fathoms.* Tres Irmaõs point is formed of three small cliffs bordered by rocks, commencing a mile west of Guajuru hillock. Westward of Tres Irmaõs point the shore trends in a westerly direction for 29 miles to Tubarão point, forming a bay about 4 miles deep; at 16 miles farther on is the mouth of the Rio das Conchas.

Between the entrance to Agua Maré river, at 18 miles westward of Tres Irmaõs point, and that of the Conchas, the coast is broken by several rivers and small streams, causing shallow water and numerous shoals, having from 4 to 11 feet water on them, and extending a distance of 3½ to 4½ miles from the shore; whilst the Restinga do Minhoto, a narrow ridge, 3 miles in length east and west, with 2¼ fathoms on it, lies 6 miles from the coast, with its eastern end on the meridian of Agua Maré. About 4 miles north-westward of Minhoto, in the direction of Urca Tubarão, is a sand-bank, apparently dry at low water.

SANTO ALBERTO CHANNEL.—At 2 miles westward of Tres Irmaõs point is that of Santo Alberto, known by a group of cocoa-nut trees; they are the easternmost in this immediate vicinity, and are visible from a distance of 12 or 15 miles. Between the latter point and the inner of the numerous reefs inside the hook, or west end of the Lavandeira, is the channel of Santo Alberto, about half a mile wide, and carrying 13 feet water. Passing inside the Lavandeira and other reefs, a steam vessel whose draught will admit, will have no difficulty in using this channel by keeping a short half mile from the shore; this passage is much frequented by native vessels. Having passed through it the water will again deepen, when the vessel may proceed to the westward, or anchor off the fishing village of Caiçara 2 miles south-west of Santo Alberto point, according to circumstances, and where landing may be effected at all hours of the tide. Fowls, sheep, and fish may be purchased.

Tides.—It is high water, full and change, off Caiçara at 6 hours.

* For the description of the outer reefs, between cape St. Roque and Tubarão point, see pages 50 and 51.

Agua Maré river.—The mouth of this river, where five streams run into the sea, is choked with sand-banks, leaving passages into it about 3 feet deep, when it trends to the eastward parallel to the coast, for 8 miles. The entrance of this river is distinguishable from the offing by mount Mangue Secco 6½ miles to the westward of it, which is visible in clear weather from a distance of 21 miles. The village of Agua Maré stands at the confluence of the streams at the western side of the entrance.

RIO AMARGOSO or ASSU, the principal of the several rivers on the north coast of Rio Grande do Norte, disembogues at 12 miles westward of Tubarão point. Its mouth is encumbered by sand-banks, with a channel over the bar, of about 5 feet, 3 miles north-west of the entrance points; within the bar the depth increases to 4½ fathoms off Macáu, beyond which the water gradually decreases to one fathom at 4 miles distance. The town of Macáu stands on the right bank at about 3 miles from its mouth, and at half a mile above it is the entrance to the salt lagoons. Many parts of Brazil are supplied with salt from this neighbourhood.

Eastward of the Amargoso are the mouths of the Alagados, Arrombados, and Tubarão; whilst westward is that of Cavallos and Conchas, the latter being the second in size, has a channel 3 feet deep, increasing to 7 feet between the entrance points.

The COAST, from Conchas point at the west side of entrance to Conchas river, in latitude 5° 5′ S., longitude 36° 45′ W., trends north-westward for about 12 miles to Mel point, which is composed of red cliffs, with low white spots of sand on each side of them, and where there is a small village and some cocoa-nut trees.

About midway between Conchas and Mel points is the village of Rosado and some cocoa-nut trees, fronted by a reef of rocks about a mile in extent, lying obliquely with the shore. Here the land becomes higher and level, and continues so for about 4 miles westward of Mel point. This part of the coast is fronted by shoals, which extend 3½ miles off, and have from one to 1¾ fathoms water over them; but there is a passage carrying 2¾ fathoms water between them and Mel point, about three-quarters of a mile from the shore.

At 5½ miles beyond Mel point is Redonda point, with a village and cocoa-nut trees; from thence the coast trends westward for 11 miles to the entrance of Rio Mossoro, which separates Rio Grande do Norte from the province of Ceara.

Tibaõ hill, about 10 miles north-west of Rio Mossoro, is a hill of red sand, terminating at the sea and very remarkable. Grossa point (Retiro Grande) at about 18 miles farther to the north-west, is rugged, with a pinnacle close to its base, which, when bearing W. by S., will appear open. The land south-east of this latter point for 3 or 4 miles has a singular appearance like two steps, the lower being reddish and the upper grey. At about a mile from the point there are several rocks, the outer of which is covered at high water; the shore between the mouth of Rio Mossoro and Grossa point is bordered by Cajucas bank, which extends about 5 miles to seaward. The shore closer in, is bordered by the recife.

JOAO da CUNHA is a group of dangerous rocks, which only occasionally uncover, about 1½ miles in extent, with 10 to 14 fathoms water close around, and from a half to 4½ fathoms between them. The shoal will be observed even when covered, if a careful look-out be kept when approaching. The northern edge is 10½ miles North from Redonda point. There is a depth of 19 fathoms at 2½ miles north of the group, and to the southward the water gradually shoals from 12 fathoms, to 3½ fathoms at a mile from the shore.

RIO MOSSORO.—The mouth of this river is encumbered by sand-banks, leaving a narrow passage into it, with a depth of 3 feet. Within the sand-banks, the depths increase to 3½ and 4½ fathoms. There is a small village named Povaoção, and mount Dantas, a conical hill, on the west side of entrance. Formerly a considerable trade in salt was carried on by coasting vessels, but it is diminishing on account of the bar which is said to be gradually filling up.

RETIRO BAY affords anchorage in 3 fathoms water, westward of Grossa or Retiro Grande, 300 feet high, or farther in if the vessel's draught admit of it, where there is smoother water, as the rocks off the point break much of the sea. Here vessels bound to Aracati generally anchor when wishing to communicate with that place. There is a house in the bottom of the bay for the accommodation of travellers, and farther up the valley are others, where probably a horse and guide may be procured. The distance from this place to Aracati is about 18 miles, and a great part of the way is along the sea-shore. In entering Retiro bay give Grossa point a wide berth, and steer in with a hill in the south-west part of the bay bearing S.W., and anchor when the point bears S.S.E.; avoiding Retiro bank, which extends nearly 5 miles off the shore to the north-westward.

RIVER JAGUARYBE (ARACATI).*—The entrance to this river, navigable for vessels of about 10 feet draught, lies north-westward, about 17 miles, from Retiro bay. It is narrow and dangerous, having shifting banks of quicksand on either side, on which the sea breaks with much violence. The river, when swollen with rains, forces its way through the banks in various directions, forming new channels, so that there is no certainty of their being long in one position. In the dry season vessels may be detained here for months for want of sufficient water on the bar to leave the river.

The river widens immediately within the bar, forming a basin about half a mile in extent, having from 6 to 14 feet water. For a considerable distance the western bank is comparatively high, but the eastern side is flat all the way to the town of Aracati; on both sides the shores are covered with mangroves. At about half a mile southward of Sandy point the east point of entrance, is O'Neil bank, occupying about two-thirds the breadth of the channel, with a passage eastward of it with depths of 2 to 3 fathoms. The bank dries at 2 hours ebb. At 3 cables south-west of O'Neil bank, is Cocoa-nut island, with another small island on the eastern shore southward of it. The river trends to the southward, carrying from one to 3 fathoms water for 7½ miles from its entrance to Smack point, where it curves to the eastward and thence south and south-west to the town of Aracati on the right bank, about 12 miles from the entrance.

Aracati has a considerable trade chiefly in cotton and hides procured from the surrounding country, which are exported principally by native vessels. The town consists of one long street extending east and west, with several minor streets branching from it to the southward. The houses, unlike those of any of the villages in the vicinity, are of two stories, because the floods are sometimes so great as to render it necessary to retreat to the upper part of them. It has three churches, a town-hall, and a prison. The stream abreast it is fordable at low water, and some parts of the bed of the river are dry. The population is estimated at about 9,000.

LIGHT.—Pending the completion of a lighthouse in course of construction, a provisional light is exhibited on the headland within the bar, at Jaguarybe river entrance. The light is a *fixed* white light, visible in clear weather from a distance of 10 miles.

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* *See* plan on Admiralty chart:—Maranham to Pernambuco, No. 528; scale, m = 1·0 inch.

Tides.—It is high water, full and change, at Aracati at 6h.; springs rise 8 feet, and neaps 6 feet.

Directions.—The land in the vicinity of Jaguarybe bar is barren; on the north side of entrance is a high red bluff, with a lighthouse, and two rocks close to the water's edge. One of the rocks has the appearance of a large gun mounted, with a small fort, flagstaff, and some huts near it. A ridge of heavy breakers, without any appearance of an opening, extends across the mouth of the river, which, with the above objects, the smoothness of the water within, and the low sandy point on the south-east side, are good marks by which the entrance may be known.

Having closed with the bar to a prudent distance, it will be necessary to obtain a pilot, or find and mark, by a buoy or boat, the deepest water into the river, which should be entered about half an hour before high water. After the outer banks are cleared, the channel trends westward, between the high sandy beach on the north, and a bank on the south side, usually marked by perches, and which dries at 2 hours ebb; the passage is narrow, and called by the pilots the funnel.

Having passed this narrow channel, steer to the southward, with the shoal extending northward from Sandy point on the port hand. When a little past the point, haul close over to the eastern shore, the channel being between it and O'Neil bank, and where the water is smooth. The bank should be approached with caution, and the lead kept going. A vessel, within the bar, whose draught of water does not exceed 10 feet, may proceed up at 2 hours flood to Cook anchorage, where vessels generally load; and, by waiting for the tide, may go 2½ miles further up with safety, and take in cargo.

Sailing out of the river is more dangerous than going in, as the wind is only favourable for passing the bar during three hours in the morning, and then it cannot be depended upon. Should it fail or head in the least, the vessel would be in danger, as a heavy sea is always running on the bar, and the channel is so narrow that anchoring would be useless. When a vessel is through the funnel, and as far down as the outer perch, and being on the starboard tack, as much canvas should be set as she can carry. No vessel should attempt to go out, if it has been blowing hard the day before, as a heavy swell will then be on the bar, and probably the breeze will not be regular.

Anchorage.—Vessels may anchor about one mile off the mouth of the Jaguarybe, in 4 or 5 fathoms, during the months of February to July, but during the remainder of the year the anchorage is not safe.

The COAST, from the mouth of the Jaguarybe, trends to the north-westward for about 60 miles to Macoripe point, at the east side of Ceará bay. The shore is a continuous succession of low, sandy hills with scarcely a sign of vegetation. Inland, westward of the Jaguarybe, is mount Azol, and about 30 miles north-westward is mount Cascarella. These peaks are conical, isolated, and about 600 feet high, and assist in identifying the coast. Southward and south-westward of Ceará are Aratanha peaks, 2,559 feet high, the Massaranguape mountains 3,018 feet high, and the Serrotes de Cunhas 2,034 feet high. These mountains of Ceará form a semi-circle around the town, at the distance of 12 or 15 miles, and may be seen in clear weather from a distance of 55 or 60 miles.

Cape Iguape, at 43 miles north-west of the river Jaguarybe, is a little salient, 394 feet high, and is more elevated than the adjacent land. To the westward of cape Iguape is a small bay, in which anchorage in 3 fathoms, sand, may be obtained at a mile from the shore. The bay is surrounded by high perpendicular cliffs, against which the sea breaks at half tide. Water may be obtained in this bay by digging. The coast is bordered by the recife, which has many breaks in it, and there are depths of 7 to 10 fathoms, at a distance of 7 or 8 miles seaward.

Caxoeira reef, from 2 to 3 cables in extent and about 1¼ miles from the shore, lies 8 miles N.N.W. ¾ W. from cape Iguape, and nearly midway between that point and Macoripe. At low water, with a fresh breeze, the sea breaks on the reef; between the reef and the shore there is a channel having a depth of 3 fathoms.

At 2 miles westward of Caxoeira reef is the entrance of the river Pacoty, which is known by a large sand-hill, 130 feet high, forming the south-east point of the entrance.

CEARA BAY.*—This bay is exposed to winds from east round by north to west, and there is a constant swell from the north-eastward. The heaviest sea rolls in during the months of February and March.

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* *See* Admiralty plan :—Ceará bay, No. 537 ; scale, *m* = 4·3 inches.

Macoripe point, the east extremity of the bay, forms the end of a chain of sand-hills about 230 feet high; the point, about 35 feet high, appears as a sandy cliff from seaward, and is marked by a lighthouse. A reef of rocks, some of which are uncovered, and on which the sea breaks, extends northward from the point for the distance of about 3 cables. The shore from the point curves to the southward, and then westward for about 4 miles, to a reef extending from a sandy beach, and forming what is known as Ceara bay. There are several rocky shoals in the bay, with deep water between them, all of which break at low water, and when there is a breeze. The depths in the bay are said to be decreasing and the foreshore advancing seaward. Plans, made by Sir John Hawkshaw, have been adopted for the construction of a harbour, the want of which is much felt and retards the development of trade.

Meirelles reefs, the easternmost in Ceara bay, lie 1½ miles west of point Macoripe, and are formed of plateaux of coral rocks, separated by a channel one cable wide, having a depth of 19 feet. The eastern shoal is circular, about three-quarters of a cable in diameter, and has a depth of 6 feet. The western shoal is about 3½ cables in length, east and west, and 2 cables north and south; the least water on it is 9 feet. A white buoy is moored in 4¼ fathoms, at 1½ cables N.N.E. from the centre of the eastern patch.

Estrella bank is of sand, has from 10 to 12 feet water, and its northern extreme lies about 4 cables distant from the coast. There is a channel between Estrella and Meirelles banks, 2 cables wide, and having a depth of 19 feet.

Great reef with a least depth of 8 feet, is situated northward of the town, and, within a depth of 12 feet, has a length of three-quarters of a mile N.W. by W. and S.E. by E., and a width of a quarter of a mile. The east part of the reef is marked by a red buoy, moored about a cable from the nearest breakers.

Velha reef, lies northward of Great reef, and is separated from it by a channel half a mile wide. It is a coral shoal of 9 to 12 feet in depth, about 4 cables long in a north and south direction, and one cable broad. A red buoy lies about a quarter of a mile off its northern end.

Harbour reef extends about 3 cables to the north-west and is covered by the accumulation of sand on the east side of the pier.

HARBOUR.—Between Great reef and the shore, fronting the town, are depths of 18 to 20 feet. This portion of the bay is named the harbour. The depths in the bay are said to be decreasing and the foreshore advancing seaward.

The town of Ceara (Villa da Fortaleza), about 2½ miles westward of Macoripe point, is the most important upon this part of the coast, and contains (1892) about 37,000 inhabitants. The streets cross each other at right angles, are well paved, lighted with gas, and clean; the town is generally healthy and is yearly increasing in importance. It contains a cathedral, several other churches, town hall, custom-house, and treasury, and is protected by a fort standing on a sand-hill near the shore. The town has a considerable trade in cotton, coffee, sugar, hides, and india-rubber.

Landing can be effected at all times on the spit formed by the sand within the pier; this spit is separated from the shore by a small channel affording access for boats at half tide to some steps just east of the gas works. During the months of February and March a heavy sea rolls into the harbour.

Supplies.—Fresh beef may be obtained here, and provisions of all kinds, but no water.

Coal.—About 250 tons of coal are usually kept in stock at Ceara; coaling is a slow process; native boats of 1½ to 2 tons convey it to the vessels in bags.

Communication.—There is communication by Brazilian steamers with Maranham, Pernambuco, and Rio de Janeiro. The Booth and Red Cross lines of steamers maintain communication between Liverpool, New York, Para, and Ceara. The town is in railway communication with Quixada, a distance of 120 miles, and a further extension to Croto is in course of construction.

LIGHT.—On the extremity of Macoripe point is a lighthouse 50 feet high, which exhibits, at an elevation of 85 feet above the sea, a *revolving* white light of the fourth order, attaining its greatest brilliancy *every minute*, and is visible in clear weather from a distance of 12 miles.

Pilots may be obtained by making the usual signals; they come off in catamarans, but never farther out than about 2 miles. Pilotage is compulsory except for vessels of war.

Anchorage.—Small steam vessels generally enter the inner anchorage by the channel, east of Great reef; and sailing vessels by the wider channel west of the same; but neither should be entered without a pilot. For steam vessels of greater size, the western channel is preferable on account of its greater depth, and also as it leads the vessel in head to wind, which is an advantage in so confined an anchorage. Moor in 6 fathoms, with the fort bearing about South; the holding ground is good, and vessels having good ground tackle never drive.

A vessel of large draught should anchor in Ceara road in 5½ or 6 fathoms, over sandy ooze, good holding ground, with the lighthouse bearing E. by S. ½ S., distant 2¼ miles; and sailing vessels should anchor here if the pilot does not come off at once; many vessels have been swept to leeward by the current through making too long tacks off the port. There is good anchorage in Macoripe road, westward of the lighthouse, in from 3 to 5 fathoms.

Tides.—It is high water, full and change, at Ceara, at 5h. 35m.; springs rise 8 feet.

In the offing a current runs to the westward at the rate of 1½ miles an hour.

Winds.—During the dry season at Ceara, that is from July to December, the winds during the day vary between east and N.E., freshening considerably in mid-day, and replaced during the night by a light land breeze. In the rainy season, especially from March till May, the winds are light and variable, with squalls from north to west and south-west. In April the squalls are said to be very heavy.

Directions.—The peak of Massaranguape, the highest and most conspicuous of the Ceara mountains, situated about 16 miles S.W. by W. ½ W. of the town, is a good mark for Ceara, from the offing.

Eastern channel.—When coming from the eastward run down in the latitude of Macoripe point, to which give a berth of three-quarters of a mile. After passing the lighthouse it should not be

brought to bear eastward of E. by S. ½ S. until the two towers of the cathedral come in line, bearing about S.W. by S.; this mark will lead about 2 cables eastward of Great reef. When abreast the buoy, or when the lighthouse bears E. ½ S., keep to the westward about 1½ or 2 points, until the window or grating of the south tower of the cathedral comes open of the west angle of the north tower. By keeping the towers in this position, a vessel will pass clear of Harbour reef. As the cathedral towers are not far apart care is required in bringing the marks on.

Western channel.—From off Macoripe point, steer about W. by N. ½ N. to pass northward of the red buoy north of Velha reef; then W. by S. until the dome to the westward of the town town bears south. Steer for the dome on that bearing in soundings from 6½ fathoms decreasing to 3½ fathoms, until the custom-house, which is near the landing place, bears S.E. ½ E. Steer for it on that bearing and anchor in 3¼ fathoms where convenient.

There is a channel a quarter of a mile wide, and 4 fathoms deep, between Velha and Great reefs, but as it is not buoyed, vessels are recommended to use the routes described instead of running through this channel by a bearing of Macoripe lighthouse.

The COAST from Ceara, trends in a north-westerly direction for 58 miles to Morro Melançia, an isolated down of sand within Mandahu point, visible in clear weather from a distance of 20 miles. It shows white to the eastward and dark to the westward. South-west of Morro Melançia about 28 miles, are the Uruburetama ou de Mandahu mountains. In the immediate distance are the mouths of the rivulets Ceara, Cauipe, Pericuara, San Gonçalo, and the Curu.

About 20 miles north-west of Ceara, off Os Irmãos point, a reef extends about half a mile to the northward; also westward of this point, for the distance of about 15 miles, the shore is foul in places to the distance of half a mile.

Anchorages.—Curumicuara point, situated 4 miles north-west of the village of that name, and about 32 miles north-west of Ceara, is the most salient point on this part of the coast. It is formed of sandy downs, may be recognized by the wooded conical hill 2 miles within it, named Little Mamelon, and which is visible about 18 miles. The point has a reef extending off for the distance of 2 or 3 cables. Westward of the point, there is good anchorage for small craft, off

the mouth of the San Gonçalo, and of the village. Also about 8 miles north-west of San Gonçalo, westward of Parazinho point, there is similar anchorage in Curu bay, off the mouth of Curu river. There is also a village here.

MANDAHU.—Anchorage.—Mandahu point is encircled by a reef which extends nearly half a mile off shore. It projects also westward of the point, forming south of it an excellent anchorage from 2 to 3 cables across, for 3 or 4 small craft in 10 to 12 feet of water. There is a village in the bay, which should be a prosperous one, as it has the rare advantage on this coast of having a snug little anchorage, and communication with the interior by the river Mandahu, one mile to the westward, by which means the produce can be brought to the coast.

There is anchorage one mile off shore in about 4 fathoms.

COAST.—From the Morro Melançia the coast trends north-westward for 21 miles to Patos point; the intermediate coast points are bordered by sand-banks and the recife (covered by fishing stakes), to the distance of half a mile, increasing near Patos point to about one mile. The hills are wooded, and visible from 14 to 16 miles, and there are several fishing villages along the coast. Close westward of Patos point, the Aracati Assu debouches; it is only available for very small craft or boats. At 9 miles to the westward is the Aracati Mirim: the sand-hills composing the coast between are visible about 12 or 14 miles. The village of Almofala is situated on the bank of the river Aracati Mirim, navigable for small vessels. From the offing the steeples of the church may be seen among a group of cocoa-nut trees; and 2 miles eastward of the river is a pilot's flagstaff on a sand-hill.

From the Aracati Mirim, the coast trends north-westward about 12 miles to Tapage point, which is wooded, thence westerly for the distance of 30 miles to Jericoacoara point; all this portion of coast is fronted by Acaracu bank.

Inland, about 28 miles from the coast, are the Serra Mocuripe, the eastern point of which, named Morro do Curral Grande, is 2,800 feet in height, and may be seen a considerable distance in clear weather. It appears as a double nipple hill with a saddle between.

ACARACU BANK, composed of sand and mud, is named after the largest village on the coast off which it extends; it may

be said to begin at Patos point, from whence it gradually increases its distance from the shore until abreast of Tapage point, where there is but 4¾ fathoms at 13 miles N.E. of the point; thence it lies parallel with the shore, for a distance of 10 miles, to Jericoacoara; beyond that it inclines again to the shore until off Camocim river, where its outer edge of 5 fathoms is 5 miles distant from the shore.

With a fresh wind against the tide, there is a chopping sea on the bank within the depth of 3 fathoms, and it is advisable in vessels of large draught not to sight the coast, but to keep at a distance of 12 miles from it. At this distance the tops of the cocoa-nut trees are only just seen in the finest weather.

When abreast of Jericoacoara, a vessel may close the land to a prudent distance; there are no dangers, and 4 fathoms water will be found at half a mile from the entrance to the cove of that name.

ACARACU RIVER, lies about 9 miles westward from Tapage point; from off the entrance Jericoacoara hills are just seen above the horizon. The village will be seen, amongst the trees, at about 7 miles from the shore, and where the depths are about 3½ fathoms. The pilots state there is a depth of 13 feet in the entrance at high water, and 3½ fathoms in the river near the village.

Buoys.—A buoy lies in 10 feet about 5½ miles N. by E. of the entrance; and the channel into the river is marked by stakes.

Brazilian steamers call off the port and take nearly all the produce, which consists principally of cotton, salt fish, and maize.

JERICOACOARA POINT forms in two hills, the eastern is 360 feet high, and the western 280 feet high. It is visible from the offing about 23 miles, and, at first, appears as an island.

Just to the south-west of the point, is Jericoacoara basin, formed by a ledge of rocks, with which the coast is bordered. The narrow entrance in the reef is not practicable even for canoes except at high water, having but little depth and choked by weeds; inside, the water is smooth. There are a few fishermen's huts here; the people live principally on the fish obtained from the lagoon at low water, when they are easily speared.

By remaining some days at Jericoacoara, vessels might procure cattle and poultry at a low price, by giving timely notice to enable the people to bring them to the coast, and the supplies may be depended on. No vegetables fit for eating are to be obtained; water may be obtained by digging wells on the beach.

Anchorage.—There is sheltered anchorage for small craft in about 3 fathoms, one mile W.S.W. of Jericoacoara point, or farther in, if convenient, as the soundings diminish regularly. Landing is easily effected at high water, under shelter of the point.

Tides.—It is high water, full and change, at Jericoacoara, at 5h. 15m.; and the spring rise is 8 feet.

The COAST from Jericoacoara point trends in a westerly direction for about 67 miles to Barra Velha d'Iguaraçu, and is composed of low white sand, having in the interior, here and there, clumps of small brushwood. Inland, are the Serra da Tiaia, the peaks of which are visible about 30 miles in clear weather; farther to the south-west, and about 25 miles from the shore, are the Serras Hibiapaba, 3,347 feet high, and which may be seen in clear weather; these are the last mountains in the direction of Maranham.

Between the points mentioned are the mouths of the little rivers Camocim, Tapuiu, Timonha, &c., which may be seen in running along the coast in-shore; the first of these are navigable for coasters, the others will not admit even boats. The shore is bordered by the recife; and westward of Jericoacoara at one to 4 miles distant from the shore, there are depths of 4 to 6 fathoms, over ooze, sand, or broken shells. Off Jericoacoara the bottom is composed of small red and white stones; and off Paranahyba, yellow, blue, and red stones.

A shoal, with a least known depth of 2½ fathoms, lies 9 miles N.N.W. ½ W. from Morro de Camocin, with 6 and 7 fathoms close-to. As the bank has not been further examined, less water may exist. The current in general sets strong to the westward.

RIO CAMOCIM is a small river much frequented by coasters. Its entrance lies 20 miles westward from Jericoacoara point and it may be recognised by the sand-hills on each side, which are visible from 13 to 14 miles.

Point Feijao, the eastern point of the bight, has patches of rock lying from one to 2½ miles, N.N.W. and W.N.W. of it; and must not be passed within 3 miles.

There is good holding ground off the entrance to the river in about 4 fathoms, with Feijao point bearing E. by S. ¾ S., and Camocim point, W.S.W.

Bar.—Sand spits and banks extend a distance of 2 miles north-

ward of the entrance points of the river. The channel which lies in a S. by W. ½ W. direction, is marked by buoys or stakes. It is stated that vessels of 14 feet can pass the bar, which nearly always breaks, at high-water springs. There is reported to be a depth of 3 to 4 fathoms in the river within the bar, but it is said to be gradually filling up.

The town of La Granja with about 3,000 to 4,000 inhabitants is situated about 15 or 18 miles up the river; formerly there was considerable trade by the river, but since the formation of sand-banks river it has much decreased.

Steamers from Ceará to Pará call here monthly.

PARANAHYBA RIVER.—The land which separates the different branches of this river is low, covered with trees and uniform in appearance, except an occasional sand hill, which indicates the entrance of a river. The delta is almost inundated in the rainy season, except five of the islands next the sea which are never overflowed, and afford excellent pasturage for cattle; the delta forms a curve to the northward, skirted by a reef to the distance of 2 miles from the shore. The water is very muddy over ooze and sand off the delta, and at the distance of 4 or 5 miles from the land there are depths of 8 to 10 fathoms.

It is said that for nine months in the year the land here is enveloped in haze, which, added to the heavy sea and strong westerly current which constantly prevails, renders caution necessary in approaching it. In fact, so uniform is the coast that the pilots frequently mistake one point for another.

LIGHT.—From a lighthouse on point Pedra do Sal, at 6 miles west of Paranahyba entrance, is exhibited a *fixed* white light, visible in clear weather from a distance of 10 miles. A reef which dries, lies 1½ miles N.N.E. of the point.

Velha d'Iguaraçu is obstructed by sand-banks, through which there is a narrow channel with a depth of about 3 feet at low water, into the river. The channel from latest reports (1876) was nearly parallel with the eastern side of Great island, and marked by buoys and stakes.* The changes in the position of the banks are frequent and rapid, and entrance must not be attempted without the assistance of a pilot, who will come off during ebb tide only. The sea is always heavy on the bar, especially during the ebb.

* *See* Admiralty plan:—Paranahyba river, scale, *m* = 1·05 inches, on chart, No. 528.

Amaraçao has a considerable trade in bullocks and cotton.

There is anchorage off the bar of Velha d'Iguaraçu in 4 fathoms, sand and mud, at about 1½ miles north-eastward of Great island, or one mile from the breakers.

Tides.—The tides run at the rate of 4 or 5 miles an hour in the passage; outside the bar the ebb sets to the northward.

It is high water, full and change, at Amaraçao, situated one mile within the entrance, at 5h. 15m.; springs rise 11½ feet.

Tutoia river is the western embouchure of the Paranahyba, and the only harbour along the coast between Pernambuco and the Amazon that can be entered at all times of tide by a vessel drawing 18 feet of water. The harbour is formed between the bank which extends from the western shore and Papagaio islet, which is low, wooded, and the termination of the wooded shore; westward of it, and of the entrance to the river, the sandhills recommence.

This bank, named Tutoia reef, breaks heavily, and extends to within 3 cables of Papagaio islet, leaving a channel of that width between it and Papagaio spit, with depths from 20 to 26 feet at low water.

Anchorage.—In the harbour or anchorage, which is capable of accommodating a large number of vessels, there is anchorage just south of Papagaio spit in about 4 fathoms; about 2 miles farther southward, there are depths of 5 and 6 fathoms; but between these two anchorages are sand-banks, some of which dry, and must be left to the eastward. As the entrance is liable to change, and is difficult to distinguish, it is necessary to anchor outside, east of Tutoia reef in from 4 to 5 fathoms, and examine the channel banks at low water by boat, before attempting to enter the river. This precaution is especially necessary, as at high water, the sandy spit (the west point of Papagaio) which marks the eastern side of the passage is then entirely covered.*

Tides.—It is high water, full and change, at Tutoia anchorage at 5h. 15m.; springs rise 12¾ feet.

The COAST.—Landmarks.—The coast from Tutoia river to the Perguiças, about 28 miles to the westward, is composed of white

* Captain E. Mouchez, French Imperial Navy. *See* plan of Tutoia anchorage, scale, $m = 0{\cdot}3$ of an inch, on Admiralty chart, No. 528.

sandy downs, dotted with clumps of trees; the most remarkable of which is a clump named Matto de Saint Cosme, 17 miles west of Tutoia river; it appears from the offing like a black islet, and is visible about 13 miles.

The Lençoes.—Westward of this clump the shore has the appearance of linen or clothes spread on it, and has received the name of Lençoes Pequenos (Little Sheets), in contradistinction to a more extensive range westward of the Negro, named Lençoes Grandes.

The coast westward of the Perguiças river trends about west-north-west for a distance of 40 miles, and it resembles that which precedes it to the eastward. Westward of the Negro, the downs continue to be of bright sand, but higher, and are called the Lençoes Grandes (Great Sheets). Nothing can more resemble than they do the appearance of white linen spread on the shore, and which is a most useful mark for this part of the coast. It is advisable for vessels bound to Maranham from the eastward, to sight these downs before proceeding westward, but from there being no background, or any thing to catch the eye, it is difficult to judge the distance from the land, and the only guide is the lead.

The Mamelon, a small black isolated nipple-hill, is remarkable, it is situated on the right bank of the embouchure of the Rio Negro, 14 miles west of the Perguiças. The hill is covered with trees which have the appearance of a sloping declivity, and from a distance appears like a black islet. Towards the western end of the Lençoes Grandes, there are three or four hills a little higher than Lençoes Grandes, and which are known by the name of Alegres hills; they are visible 14 or 15 miles.

Immediately to the westward of Lençoes Grandes the coast trends to the south-westward, and entirely changes its appearance. From being barren, it becomes covered with trees and brushwood. The shore is low, and called the praia das Mangues Verdes, or beach of Mangroves. The sudden transition of colour between it and that of the Lençoes Grandes renders it impossible to mistake it. Viado hill, a small wooded mountain 5 miles inland, is visible about 18 miles.

A shoal, with a depth of 3¾ fathoms, is reported to exist about 16 miles N. by W. ¼ W. from the entrance to Tutoia river, and about 22 miles E. by N. from the Perguiças.

The 10-fathoms line of soundings is irregular in its outline, but as a general rule that depth will be found at 10 miles from the coast, between Tutoia and Mangues Verdes. The coast is fronted by a reef which extends seaward, generally from 2 to 3 miles.

Rio Perguiças.—The entrance of this river may be known by a large mass of remarkable trees situated on its west bank, and visible 13 miles. The east bank near the entrance is formed by a long point of sand which nearly dries at low water. The mouth of the river is obstructed by two reefs, which extend from either bank in a north-east direction and form a channel, which is divided near its outer end into two passages. Vessels drawing 16 feet can enter at high-water springs. Formally the Perguiças was much frequented, and large brigs were constructed in it, but the river has of late years been almost abandoned.

There is good anchorage 3 miles north-east of the river entrance, one mile beyond the breakers, in 3 to 4 fathoms, sand, and sticky mud; good holding ground.

Perguiças reef or **Emily bank,** about 3 miles long, east and west, and about 1½ miles, north and south, has from 6 to 9 feet water. Its eastern end lies N. ¾ E., distant 5 miles from the entrance of Perguiças river. The water breaks on the reef at low tide and during a breeze. Between the reef and the coast there is a channel of 4 or 5 fathoms depth, but having shoal patches of 13 to 15 feet water.

At 4 miles N.N.E. from Perguiças reef lies a shoal of 23 feet, having from 5½ to 6 fathoms round it. As the extent of this bank in an east and west direction is uncertain, vessels should avoid the locality.

Rio Negro, a small river, lies 15 miles westward of the Perguiças.

Reef.—An isolated patch of 2¾ fathoms lies N. ¾ E., distant 5 miles from Mamelon hill. Between the reef and the shore, the depths are from 3¾ to 4½ fathoms, with 2½ fathoms at one mile from the shore.

Cruz bank.—Off Alegres hill there exists a group of banks about 6 miles in extent, and having from 3 to 8 feet water; the outer one is called Cruz bank, on which many vessels have been stranded. The north-east edge of the bank is N.E. ¼ N., about 6 miles from Alegres hill. There is a depth of 10 fathoms at half a mile northward of Cruz bank.

SANTA ANNA REEFS.—These reefs, which nearly always break, extend in a circular form from the north point of Santa Anna island to near Mangues Seccos point. Cesar bank, which is the north-east extremity of the bank, is nearly 9 miles E. ½ N. from Santa Anna lighthouse. There are depths of 4 or 5 fathoms, sand, close to the banks.

Rio Preha.—Anchorage.—Within Santa Anna reefs off Rio Preha and to the westward of Mangues Seccos point, there is a capacious and secure anchorage in 5 to 6 fathoms. The best passage is between the southern extremity of Santa Anna reefs, and Mangues Seccos point, passing about a mile north-west and 2 miles west from the latter; the least depth will be 19 feet. As the passage is rather intricate, and as no marks can be given, it is necessary to examine the channel before the vessel enters. The tidal streams in the entrance of the channel run at the rate of 3 or 4 miles an hour at springs.

Tides.—Within 3 or 4 miles of Santa Anna reefs the tidal influence from Rio Preha is felt, the flood sets to the south-west and the ebb north-east. It is high water, full and change, at 5h. 45m., rise on the reefs 13 feet.

SANTA ANNA ISLAND.—This island is about 10 miles in extent, and covered with mangroves, and other trees. The lighthouse may be seen from the deck of a vessel at the distance of about 15 miles. The island is surrounded by reefs on which the sea breaks, and from its north-east end they extend to the eastward in a circular form for about 9 miles. The breakers are seldom seen until the land is well in sight. A vessel having made the breakers may steer along their northern side at a distance of from one to 2 miles. The channel between the island and the main land leading to San José bay is very little known, and the flood tide runs rapidly into it.

LIGHT.—From a cylindrical tower, 148 feet high, painted white, situated about one mile within the east point of Santa Anna island, is exhibited at an elevation of 190 feet above high water, a *flashing* light, showing in succession *two white flashes* and *one red flash* of equal power, with an interval of *thirty seconds* between the flashes. It should be visible in clear weather from a distance of 20 miles.

ST. JOSE BAY.—At about 17 miles south-west of Santa Anna island is that of Maranham; the space between them is little known; it is nearly choked with reefs, which extend about 15 miles off shore, named the Great Coroa banks, many of which are awash at low water.

There are intricate passages through these reefs to St. Jose bay, which lies southward of them, and between Maranham and the main, from whence there is a dangerous and intricate channel to the anchorage of St. Luiz de Maranham. The largest and most direct channel into St. Jose bay is said to be near Santa Anna island. The flood tide runs at the rate of 4 miles an hour to the south-west, towards the bay; the ebb sets to the north-east at the same rate.

SAN MARCOS (MARANHAM) BAY is formed by the west coast of Maranham island and the main land. Its entrance lies about S.W. and N.E.; its least breadth is about 7 miles, and from the parallel of Morro Itacolomi it extends southward for about 22 miles to the harbour and town of San Luiz de Maranham; north-west of which, at a distance of 9 miles, on the main land, is the town of Alcantara. The bay is bounded on either side and encumbered with dangerous shoals, which require caution in approaching. It is, however, navigable for vessels of the largest draught. A vessel having made the land, with not sufficient daylight for entering the bay, should stand off for the night, keeping on the meridian of Santa Anna lighthouse, and at such a distance as to ensure being in the fairway in the morning.*

Maranham island, separated by a narrow channel from the mainland southward of it, is about 25 miles in length, in a north-east and south-west direction, and 15 miles in breadth. It is fertile and well wooded, and intersected by white cliffs on its northern side.

San Luiz de Maranham, the capital of the province, stands near the western extremity of the island upon a neck of land about 90 feet high. *See* page 455.

Morro Itacolomi, 269 feet high, and covered with trees, is situated at the west point of the entrance to Maranham bay. When first seen, it appears like a small round islet, and in clear weather may be visible from 15 to 20 miles. By this isolated mount and the lighthouse near it, the coast may be readily known; the land to the northward forms a deep bay, and to the southward it is composed of low red cliffs, trending about S.S.E. There is no similar mark in the vicinity, and it is therefore a good landmark and point of departure. *See* light on page 457.

At the distance of 5½ miles south-eastward of the morro, is Pirajuba, a cliffy point, and nearly 4 miles farther on is Morro

* *See* Admiralty chart:—San Marcos or Maranham bay, No. 535, scale, m=0·53 of an inch; also plans on charts No. 528; and No. 1,803.

Alegre, 187 feet high, with some red cliffs just to the northward. At about half a mile southward of Morro Alegre is a yellow spot in the land, which is remarkable, and beyond it, at a distance of 2½ miles, is Raymondo point marked by red cliffs.

Nearly a mile to the southward of Raymondo point there is a remarkable sand-hill. Westward of Tatinga point, which is in the form of a small hill, the land trends westward, and at the distance of 1½ miles is the town of Alcantara, with the island of Livramento in front of it.

Alcantara.—The town of Alcantara stands on a hill; the houses are built of stone, many of them two storeys in height, but the greater part have a ground floor only. It has a town-hall and several churches. A vessel may anchor 1½ miles south-east of the town in 9 or 10 fathoms, sand, with Tatinga point bearing about N.N.E.; coasters anchor about a mile distant in about 3 fathoms. There is a light at the port. *See* page 457.

BANKS.—Great Coroa banks.—These extensive banks stretch for the distance of 18 miles in a N.E. by E. direction, and about 10 miles in a northerly direction from Maranham island, with a breadth of about 15 miles, east and west. These reefs are divided into several ridges, on the three principal of which the sea generally breaks. It has been observed that the sea always breaks during the ebb tide, but that the reefs do not show during the last half of the flood.

They are, however, generally well defined, steep-to, and at a distance of a mile on the north and west sides there are depths of 7 to 20 fathoms; but they should not be approached nearer than 2 or 3 miles. The prevailing winds being from the eastward, enable vessels bound to St. Luiz to pass these dangers at a prudent distance, and reach that anchorage without tacking. From the northern edge of the reefs, Morro Aracaju, on Maranham island, will be seen in clear weather, distant about 19 miles.

Three Brothers.—The experience of masters of vessels trading for many years to Maranham, points to the non-existence of the Three Brothers shoal. It is said to lie about 22 miles N.E. from the north-east point of Maranham island, and 13 miles N.W. ¼ W. from the north point of Santa Anna island. The shoal was reported in 1868 by a ship of the same name, and was unsuccessfully searched for by M. Mouchez. As it is near the position of a shoal formerly

marked on the charts, great care is necessary when navigating in this locality.

Meio Bank.—In the middle of the bay, about 8 miles W. ½ S. from Grand Coroa bank, is a quick-sand, named Meio or Middle bank, composed chiefly of fine gray sand with black specks. It is 8 miles in length, in a north-east and south-west direction, with a mean breadth of half a mile. The depth of water over it varies from 2 to 5 fathoms, the shoalest part being 1¾ miles from the south-west end.

Between the north-east end of Meio bank and Grand Coroa, is a bank with 2¾ fathoms, and another with depths of less than 6 feet; and between Meio bank and Maranham island is Coral bank and several others. The western edge of Meio bank is steep-to, and its distance from the land renders the approach to it uncertain by the lead, but the discoloured water usually indicates its position even on a dull day. It is unsafe to anchor on this bank as anchors sink irrecoverably into the sand.

From the north end of the bank, Itacolomi lighthouse bears W.N.W., and Pirarema point W. by S. ¾ S.; but the land from here will not be distinctly seen unless the weather be very clear. San Marcos lighthouse bearing S.S.W. leads west of it.

Peixada bank (Fishing bank) extends for about 7 miles in a north-north-east and south-south-west direction, having depths of 2¼ to 4¾ fathoms, sand and shells. It is steep-to on its east and west sides, and lies nearly on the parallel of and about 10 miles from Morro Itacolomi. From its shoalest part, which is near the southern end of the bank, Itacolomi lighthouse bears N.W. by W. ¾ W. 8¼ miles.

Almas bank, which is connected with the Peixada, is about 2½ miles long in a N. by E. and S. by W. direction, and about 1½ miles broad, with depths from 3 to 18 feet; the shoal parts are rocky, the others of sand and shells. From the depth of 3 feet, point Itacolomi lighthouse bears N.W. ⅞ W. distant 10 miles. At 2 miles westward of the centre of Almas bank there are several patches of 3¾ to 4¾ fathoms. Pirarema point in line with Raymondo point, leads to the westward of Almas and Peixada banks, in about 10 fathoms.

Itacolomi and Ovos banks.—Itacolomi bank extends 8 miles E.N.E. from the lighthouse of that name, and in the depth of 4 fathoms, near its outer end, is about 3 miles wide. At 5 miles E. by N. from the lighthouse the depths are from 2 to 2½ fathoms; with a patch of 2½ fathoms, distant 8½ miles in the same direction,

outside of which the water deepens. Within a distance of 5 miles from Itacolomi point the soundings on the bank vary from one to 2 fathoms; there is a cluster of rocks, some of which are above water, lying 1½ miles N.E. by E. ½ E. from the lighthouse. From the parallel of the lighthouse, distant about 5 miles, the edge of the bank is continued almost in a direct line towards Pirarema point, but stretching seaward 1½ miles abreast Morro Alegre. Vessels should not anchor on this bank, as the anchor sinks deeply and is often irrecoverable.

Ovos banks extend about 5 miles off the shore, northward of Morro Itacolomi. They usually break, but as the soundings in approaching them are irregular, and the tides strong, it is advisable to give them a wide berth at all times.

Cerca bank lies off the town of Maranham, at the north-west limit of the anchorage. It extends 2¾ miles in a north-east and south-west direction, and is about 4 cables in breadth, with 4 feet on its shoalest parts, and on which the sea breaks. The centre of the bank, principally rock, lies about 2¼ miles W.N.W. of San Marcos lighthouse. The church of Nossa Senhora dos Remedios, in the north-east part of San Luiz, in line with S. Francisco point, leads south of the bank. The north-east end of this bank is marked by a buoy, painted black, white and red in horizontal stripes.

San Marcos bank, situated one mile north-eastward of San Marcos lighthouse, is composed of sand and coral, with patches of less than 6 feet. It extends about 2½ miles in an E. by N. and W. by S. direction, with a breadth of about 7 cables. It nearly always breaks at low water. Between the bank and the shore, is a channel with depths of 2 to 2¾ fathoms. A detached patch of 2 fathoms, lies nearly one mile north-east of the bank.

Medo island.—Boqueirão channel.—At nearly 3 miles W. by S. ½ S. from Areia point, entrance to San Luiz, is Medo island, about half a mile in extent; and about half a mile north-east of it are some rocks which uncover at low water. The island and rocks are surrounded by a bank, between which and the flats extending from the shore, is a channel named Boqueirão. It is about 2 cables in breadth, with depths of 5½ to 13 fathoms water. It should not be attempted without a pilot.

SAN LUIZ HARBOUR.—From San Marcos lighthouse, the coast becomes low and trends south-westward to Areia point which is low and sandy, and has a small fort named San Antonio on it. It is

fronted by a sand-bank, with depth of less than 6 feet, to a distance of about 7 cables from the shore. From Areia point the coast trends south-eastward, forming a deep inlet about one mile in breadth, in which is San Luiz harbour. The town of San Luiz is situated 1½ miles within Areia point, and nearly opposite Bomfim, the south point of entrance. It stands on the promontory which divides the small rivers Anil and San Francisco.

Buoyage.—The term Starboard denotes that side which is on the right hand of the Mariner entering from seaward, the term Port that on the left hand under the same circumstances.

Conical buoys, painted red, with even consecutive numbers, mark the starboard side of the channel.

Can buoys, painted black or black and white, with odd consecutive numbers, mark the port side of the channel.

Buoys or other marks, in mid-channel, are painted in horizontal stripes of any two colours.

Buoys marking rocks in the channel, with a passage on either side, are painted in black, red, and white horizontal stripes.

Wreck marking buoys are painted green, with the letters C.S. on them.

San Luiz or Maranham is about one mile in length and half a mile in breadth, and contains a cathedral, many churches, three monasteries, and six hospitals, of which the Misericordia is the principal. It has numerous schools, and a good hospital for merchant seamen, which is kept up by certain charges on all vessels arriving. One of the most picturesque walks within the precincts of the city is the public cemetery. There is also a Protestant cemetery.

Maranham is said to be better built than any other town in Brazil, and ranks as the fourth in the empire. It is tolerably healthy, and no serious endemic sickness is known. In the time of the rains there are some few cases of fever, which generally yield with proper treatment. The population of the province of Maranham may be 400,000, and that of the town from 30,000 to 35,000.

The exports consist in coffee, wood, skins, cotton, rice, sugar, hides, &c. The number of vessels that entered the port in 1891, was 184, of which 154 were steam ships, amounting in all to 262,409 tons; cleared 180 vessels of 261,730 tons. In this year the value of the imports amounted to 340,360*l.*, and the exports to 481,019*l.*

Winds and weather.—The year at Maranham may be divided into two seasons. The winter commences in December and ends in May, and the summer follows, and continues during the other months

of the year. The first of these seasons is that of the rains which fall abundantly, the winds then are generally from east to north, weak and variable, with heavy squalls from N.W. and S.W. in February, March, and April. The thunder and lightning are then almost constant. Hurricanes are not experienced at Maranham; and in the worst part of the year there are long intervals of tolerably fine weather.

Rain falls sometimes during summer, and in this season the winds blow mostly from S.E. to east with a force of 7 to 8 during the day, but much lighter at night, these being the general winds. At the change of season, from dry to rain, the winds are variable and incline to the westward. The temperature of the air is high in the town, more especially from the month of December to that of June. St. Luiz, standing on the west side of the island, does not experience the full force of the winds from the eastward, those which reach it being weak.

Entrance channel.—An extensive mud bank, partly dry at half tide, extends across from the west side of the harbour, and to the northward and westward of Bomfim point to about 1½ cables of Areia point, which contracts the navigable part of the channel to San Luiz, to a breadth of from 1½ to 2½ cables. The bar, with 15 feet at low water, lies nearly half a mile north-westward of Areia point; from thence, the channel passes rather more than one cable south of the point; inside, the depths are from 16 to 24 feet.

A red buoy marking the telegraph cable, lies W. ½ S. distant 1½ miles from Areia point.

Anchorage.—There is a depth of 18 feet off the custom-house, but as the channel is narrow, caution must be used when taking up a berth. It is necessary to moor. There is good anchorage for a long vessel half way between the fort and S. Francisco point, with the latter bearing S. 38° E., in not less than 3¼ fathoms; this position is nearly always clear, as merchant vessels go higher up.

Supplies.—Vessels will find all necessary supplies at Maranham. The water for shipping is good, but not very abundant; cattle may be procured with facility, and particularly on the mainland. Vessels can repair, beach, and if necessary, heave down. Repairs to engines are undertaken by the factory.*

* H.M.S. *Wrangler*, in 1884, was beached in the creek at the entrance to the Anil river, under the church of Nossa Senora dos Remedios; this beach is used for the same purpose by the Brazilian Mail Company. Brazilian vessels of war beach under the arsenal, at the western part of the town.

Coal.—About 1,500 tons of coal are usually kept in stock. Vessels of 18 to 20 feet draught can coal in the harbour, where it is put on board at the rate of about 150 tons per day. Outside, in the anchorage, coaling is slow, and is put on board, by lighters, at about 60 tons per day; the increased expense and risk outside is considerable, particularly in the dry season—June to November—when the strong tides and winds interfere much with coaling.

Gridiron.—A gridiron in the Anil river will take vessels of 15 feet draught at high-water spring tides. In the channel leading to it, there is a depth of 24 or 25 feet at the same time.

LIGHTS.—Near the shore in the vicinity of Morro Itacolomi, on the western side of San Marcos bay, stands a large two storied white house surmounted by a square tower, which exhibits, at an elevation of 149 feet above the sea, a *fixed* white light, varied by a *white* flash *every two minutes*, and should be visible in clear weather from a distance of 18 miles.

At Alcantara, from a lighthouse on the point south-eastward of the town, is exhibited, at an elevation of 64 feet above high water, a *fixed* white light, visible in clear weather from a distance of 9 miles. It is probably not seen from seaward, until open of Tatinga point.

On point and fort San Marcos, at 1½ miles north-east of the entrance to San Luiz harbour, is a lighthouse which exhibits at an elevation of 119 feet, a *fixed* white light, visible 15 miles.

At Areia point, from a lighthouse on fort St. Antonio, north side of entrance to the harbour, at an elevation of 21 feet above high water, is exhibited a *fixed* light, showing white between the bearings of S.E. and S.S.W.; and *red* between the bearings of S.E. and W.N.W., visible in clear weather from the distance of 7 and 4 miles respectively.

Anchorages.—A vessel which has but a short time to stay in San Marcos bay will find a berth in 10 or 11 fathoms, sand and mud, with smooth water, in Algoas road, about a mile northward of San Marcos bank. Vessels frequently lose their anchors here.

There is good anchorage in the road outside the harbour, between Cereá bank and fort San Antonio, with the latter bearing S.E. by E., distant from three-quarters to one mile, in from 7 to 9 fathoms, over sand, gravel, and shells. Small vessels anchor near Medo island. This anchorage is convenient on account of its proximity to the port; but during strong winds the sea is frequently heavy, which some-

times occasions the loss of anchors. Vessels should not anchor too near the bar, as the bottom here is of quick-sand, into which the anchors sink deeply, with occasional patches of rocks.*

There is anchorage always sheltered from the sea, and which is best adapted for vessels of large draught, southward of Medo isle, in 11 fathoms, sand and mud. It is still better southward of Itaqui point, in 15 to 16 fathoms, mud. The tide here is much less rapid, and the sea smooth; but that south of Medo has every security, and the advantage of being nearer the town.

Pilots may be obtained by making the usual signals. Vessels requiring them should heave to about 2 miles northward of fort San Marcos. They generally board the vessels inside Meio bank.

Tides.—It is high water, full and change, in San Luiz harbour at the custom-house quay, at 7h. 0m.; springs rise 16½ feet, and neaps 10¾ feet. At the anchorage outside the harbour, the flood sets S.S.W., and the ebb N.N.E. South of Meio bank the tides sets S.W. and N.E. Between Alcantara and San Marcos point the tides run from 3 to 5 miles an hour; between Peixada and Meio banks from 2 to 4 miles. In the broad channels the strength is from 2 to 3 miles an hour; in the offing from 1½ to 2 miles in the same direction, namely, N.E. and S.W. During the strength of the tide there are heavy overfalls in all the channels, at which period it is unsafe for ships' boats.

Directions.—As the prevailing winds are those from the eastward, it will be prudent for a vessel bound to Maranham, from whatever quarter, to make the land to the eastward, about the Lençoes Grandes, and then steer to the north-westward along the coast, which should not be approached nearer than 10 or 12 miles in from 10 to 15 fathoms water. As the flood tide runs rapidly to the south-west, towards St. José bay, it is necessary that a vessel in passing it should steer well to the northward, to clear Santa Anna reefs, which are steep-to; and, when seen, Santa Anna light can be passed at a prudent distance, taking care to allow for the flood tide. Bearings of Santa Anna light, in clear weather, will assist in ascertaining the position.

Having passed 3 miles northward of Santa Anna reefs, and being on the meridian of the lighthouse, steer W. ¼ N. about 30 miles,

* The Telegraph and Maintenance Company's steamer *Hibernia*, in charge of a pilot became a total wreck here in 1877, through being anchored too near the banks on which she tailed in swinging to the flood.

when Morro Itacolomi, which is visible from 15 to 20 miles in clear weather, should be seen like a small islet in the horizon ahead, having made due allowance for the tide; the rate of which may be taken as 2 to 3 miles an hour near the banks, and 1½ to 2 miles in the offing, the flood running about S.W., and the ebb N.E. The above course, checked by bearings of Santa Anna light, will carry a vessel southward of the supposed position of the Three Brothers, the existence of which is doubtful, and about 2½ miles northward of Great Coroa banks, the breakers on which, if there be any sea, will probably have been seen.

If the weather be clear, Morro Aracaju on the north part of Maranham, which is visible 19 miles, will be seen at the same time as the breakers of Coroa bank, and soon after losing sight of Santa Anna light. The island is higher than that of Santa Anna, and will also be known by its white cliffs. In proceeding to the southward, Morro Alto, a nipple hill, 184 feet high, whose sides are wooded and marked in vertical white stripes, will be seen; also San Marcos point with its lighthouse, about one mile to the westward of Morro Alto, terminating in an abrupt point.

The best and most frequented route to San Luiz is that westward of Meio bank, between it and Almas bank. With Morro Itacolomi or the lighthouse, bearing about West and distant 15 miles, Morro Alegre (which is the highest part of the coast southward of Itacolomi, and which has some red cliffs to the northward of it) will bear S.W. by W., and Morro Aracaju, South. From this position steer S.W. by S. between Meio and Almas banks, in 17 to 20 fathoms water, observing that Tatinga point open of Raymondo point red cliffs, leads south-westward of Almas bank;* when San Marcos lighthouse or fort, which is seen like a small islet in the horizon, bears S. by W., steer for it until Medo island bears S.W. ½ W., when steer for that island, which will lead midway between Cerca bank and that bordering the shore, to the anchorage off the town.

A vessel may also pass to the westward of Preixada and Almas banks by keeping Pirarema point in line with Raymondo point, bearing S.S.W. When within 3 miles of the red cliffs of Morro Alegre, she will be abreast the breakers on Almas bank, and should steer for San Marcos light, about S. ¼ E.

There is a channel eastward of Meio bank; but, although the

* In hazy weather, the discoloured water on the Meio bank will assist in checking the vessel's position, but the Morro should be sighted before attempting the channel.—H.M.S. *Amethyst*, 1884.

shoal parts on that bank can be seen, it is inadvisable to attempt it without local knowledge, as there are shallow patches about 2 miles to the eastward of that bank. This channel is often taken by pilots in vessels leaving late in the day, as there is convenient water for anchoring.

As the tides are strong and the outer edges of the banks are steep-to, they must be approached with caution. The soundings being irregular in their vicinity are not a sufficient guide for clearing them at night.

If the night be far advanced, or the weather thick, it is advisable to stand off and on, and not to anchor on the Meio or Itacolomi banks, as vessels generally lose their anchors on these banks.

Entering San Luiz harbour.—At low water the banks are sufficiently uncovered to show the channel. From the anchorage off the entrance, Areia point may be steered for bearing S.E. by E. ½ E. until within half a mile of it, when course must be altered to pass about a good cable south of fort San Antonio, on Areia point; thence keep between the buoys marking the channel.—(*See* page 455.) Unless it is exactly high water, the set of the tide must be considered.*

When nearly abreast San Francisco point, keep sufficiently off shore to avoid the extreme of the bank which extends 2 cables off it. The sea sometimes breaks heavily on the banks at the entrance of the harbour, rendering it dangerous for a vessel to ground; but inside the harbour it only occasions loss of time.

Outward route.—Vessels leaving the harbour of San Luiz should get under way at high water, and when outside the bar pass northward or southward of Cerca bank, as the wind will permit; the southern of the two Espera islets open west of the rock eastward of Medo islet, leads west of Cerca bank.

A vessel may tack as convenient whilst the yellow spot south of Pirarema point bears northward of W. by N.; which bearing leads over the tail of Meio bank. When to the northward of this line, stand towards Meio bank until fort San Marcos bears S.S.W.; and

* M. Mouchez states that for a steamer the navigation in and out of the harbour is easy, both by day and night.

towards Almas bank until Tatinga point is in line with Raymondo, bearing S.W. These banks are steep-to, and the lead gives no indication of a vessel's approach to them.

Small vessels may stand across the Meio at any time of the tide, as there is never less than 12 feet water on it; but as the ebb is stronger on the western side of the bay, it will be better to keep on that side. It is for the latter reason that the pilots prefer the passage west of the Meio for large vessels, although the lead is a better guide eastward of it. The parallel of the Morro Itacolomi is considered as being out of the bay, and on this line the pilot leaves.

CUMA BAY.—From Itacolomi point the coast turns abruptly to the west, and forms a deep indentation named Cuma bay, which is about 25 miles in length by about 5 miles in breadth; it is encumbered with shoals. In the middle of the entrance is a small island named Ilha dos Ovos, near which there is said to be anchorage; but the channel leading to it has not been surveyed. Several rivers, of which the principal is the Guimarens, empty themselves into the bay.

The COAST from Cuma bay trends N.W. by N., intersected with bays, streams, and a chain of islands as far as the group of San João. The approaches to them are encumbered by sand-banks, separated by narrow channels, practicable only for small vessels. At 3 miles N. ½ W. from the entrance to Cuma bay is Tucunanduba island, forming with Tru island, which immediately follows it, Tucunanduba bay. Beyond Tru island is Cauoca point, where the coast trends westward, forming Cabello da Velha bay, at the northern point of which is Mangas isle.

This bay is deep, and, like that of Cuma, receives several streams; it affords anchorage for small vessels, reached by a channel on the north shore, but, like all those on the main land, its navigation is difficult. Between Mangas isle and Tury point, about 14 miles to the north-west of it, are the islands of Gajirutiva and Carapatitiva, fronting the coast. Turyrana bay is bounded on the north-west by the isles of San João, which separates it from that of Turyassu. The former is encumbered with shoals, and is considered as closed to navigation for any but small vessels.

AMBROSE SHOAL, on which the steam vessel of the same name struck in 1870, is situated in latitude 1° 33′ S., longitude 44° 37′ W., about 5 miles north-east of Mangas isle at the entrance of Cabello da Velha bay. It is reported to extend 2 or 3 miles in an E.N.E. and W.S.W. direction, with depths of 4 to 6 fathoms on it.

MANOEL LUIZ REEF is a dangerous group of rocks, some of which are nearly awash at low water. It is situated N.E. by E. ¾ E. distant about 45 miles from St. João lighthouse, and N. ¾ E. 77 miles from Itacolomi lighthouse. The reef is about 3 miles in extent in a west-north-west and east-south-east direction, and more than half a mile in breadth. On several of the sunken rocks there are from 5 to 15 feet water, with 8, 10, and 12 fathoms close-to, and about 22 fathoms, sand and broken coral, just beyond. The sea breaks on them only at short intervals during low water; it is therefore almost impossible to see them unless passing very near.

The breakers, which rise suddenly, have the appearance of the spouting of a whale, while the sea is smooth about them; and when they cease they leave masses of white foam, which continue for some time. The west end of the reef is in lat. 0° 51′ S., long. 44° 17′ W.

No reliable indication of a vessel's distance from the Manoel Luiz reef can be gathered from the soundings; the depth and nature of the bottom near it is so variable that no correct data can be deduced. The white sandy bottom with black and red specks, comprised between the meridian of Coroa reefs and the coast of the main land to the westward, extends from 30 to 45 miles northward of the entrance of San Marcos bay; but occasional soundings are found of a different nature. Beyond this limit, and also on the bank eastward of the meridian of Coroa reefs, the bottom is sand and broken coral.

Tides.—It is high water, full and change, at Manoel Luiz reef, at 5h.; and the rise is 12 feet. The tide runs regularly six hours each way, the flood to the S.W., and the ebb to the N.E., one mile an hour

VIGIA of M. DA SILVA.—This shoal is said to have been discovered by M. Da Silva, an officer in the Brazilian navy; but, if in existence, its exact position has not yet been verified. The place assigned it is about 21 miles northward of Manoel Luiz reef, in lat. 0° 32′ S., long. 44° 19′ W., and it is questioned if this latter shoal, before its position was verified by Baron Roussin, has not been taken for it.

Shoals.—In October 1872, a shoal was reported in the middle of the passage between Manoel Luiz reef and San João islands, in latitude 1° 4′ S., longitude 44° 32′ W., 19 miles S.W. by W. ½ W. from the centre of Manoel Luiz. A depth of 5 fathoms was reported on the shoal, with 22 fathoms close to its north-west side.

The barque *Winifred*, in 1879, is reported to have struck on a

shoal of about 9 feet, in lat. 1° 10′ S., long. 44° 34′ W., or about 5 miles S.S.W. ½ W. from the 5-fathom shoal just described. They are probably one and the same shoal, but great caution must be exercised when navigating in this locality.

With these exceptions, the channel which separates Manoel Luiz reefs and San João islands is stated to be clear. Commander H. V. Haggard, in H.M.S. *Virago*, 1856, says, "the nature of the bottom changing from fine white sand with black specks, to coarse brown sand with stones and broken shells, denotes that a vessel is north of San João."

SAN JOÃO ISLANDS.—These islands are low, like those and the coast which precede them. They are separated from each other by narrow channels, and on the north-east part there are sandy downs, and a lighthouse, by which they cannot fail to be recognised. The most eastern of the group is 70 feet above the sea, entirely without vegetation, and remarkable. It is composed exclusively of white sand, which has procured for it the name of Little Lençoes. From the east end of the group, a bank of sand extends to the eastward, nearly 8½ miles, on which the sea breaks; on the north side is a flat of yellow sand, rather steep on the north-west, but sloping gradually to the north-east.*

LIGHT.—From a lighthouse erected near the north-east extremity of San João islands, is exhibited at an elevation of 78 feet above high water, a *fixed* white light, visible in clear weather from a distance of 14 miles. The lighthouse, constructed of iron, is hexagonal in shape, and painted red; the keeper's dwelling is white.

Tides.—It is high water, full and change, at San João islands, at 6h. 24m.; springs rise 14 feet, neaps 10½ feet.

Anchorages.—There is anchorage on the western side of San João group to the north-east of Muriciput bank, which is seen by the breakers. It is more sheltered as a vessel proceeds to the south, or nearer the land. It is however prudent not to bring the mouth of the most northern channel on the west side of the group, to bear eastward of S.E., and not to go into less than 6½ fathoms water. This channel between Tocausa and Maranduba islands, which has about 7 feet in the entrance at low water, affords anchorage in from 3 to 4 fathoms, about 2 miles within the entrance points. A vessel of light draught

* *See* Admiralty plan :—San João islands, No. 1,648, scale. *m* = 0·6 of an inch.

requiring repairs, and consequently having to stay a long time at these islands, could, by passing through the narrow channel which runs along the west side of the principal group, anchor between them and Jabaroca island, where she would be more sheltered than outside.

Turyassu bay is bounded on the east by the San João islands, and on the west by Tamandua point. The bay has an opening of about 20 miles in breadth, almost entirely occupied by sand-banks.

The COAST: from San João islands trends about west-north-west to Salinas point; the land all along is much the same in appearance, consisting of low hills tolerably wooded: between Manejetuba island and Atalaia point there are occasional white cliffs.

Caution.—Banks.—This part of the coast is imperfectly surveyed, and should be approached with great caution, and generally not nearer than 10 miles. The deposits from the Amazon are said to form banks, which in their turn are washed away again; some of these banks are said to be found at a distance of 10 or more miles from the land. The lead, therefore, should be constantly used.

Tamandua point, 20 miles westward of San João islands, projects about 7 miles to the north-east, and off it at the distance of about 8 miles, is the northern extremity of a line of breakers, which continues along the coast at a distance of from 5 to 7½ miles, as far as cape Gurupi, which it approaches to about 1½ miles. This bank, broken in several places, forming entrances to the small bays, surrounds also the numerous islands which border the coast. Near Tamandua point is the small island of Motuoca, between which and Acara island, is Motuoca bay.

Thence along the coast westward are the islands Maracasumé, Pirucana, and João-sinho, each of which gives its name to the bay westward of it. The land generally slopes away to a point at the end of each island; scarcely any end with a bluff. Pirucana bay has an anchorage difficult of access, through the banks which extend off to the north-east of the island of that name.*

Mount Pirucana is isolated and remarkable, being the only one on this part of the coast, and the first westward of the San João islands. Westward of San João-sinho bay are Irmaoens and Pria islands, separated by Trumahi bay. From Pria island to cape Gurupi the

* *See* Admiralty chart:—Cape North to Maranham, No. 1,803, scale; $m = 0{\cdot}5$ of an inch.

coast recedes, forming a bay about 14 miles in length, with the small islands Sumacas, Redonda, Gurupi, and Rasa, lying across its entrances.

The Pria river falls into the eastern part of this bay, to which it gives its name; the western part is named Gurupi bay.

CAPE GURUPI.—This cape is remarkable for its apparent distance from the adjoining land, and by the sands at its foot, which accumulate in some places into heaps or steep banks.

Also southward of the cape are three hills or mounds, rising from the shore at the head of Gurupi bay to a distance of 25 miles in the interior. Although only of moderate height, they are remarkable because the land eastward and westward is low.

PRIA-UNGA BAY.—Westward of cape Gurupi is Pria-Unga bay, the western side of which is bounded by Manejetuba island. At the head of the bay are three islands, by which it may be known. The Gurupi river, with its mouth a mile in breadth, runs into the south-eastern part of the bay, and is considered navigable for small vessels.

COAST.—The bank bordering the coast which approaches to within one mile of cape Gurupi, extends off to a distance of 4 miles from Manejetuba island, and borders the islands at about that distance to the westward, as far as Caïté bay, preventing approach to the coast to within about 10 miles; at which distance the shore at the head of the bays is not clearly seen.

At the distance of 12 miles westward of Manejetuba island is that of Carauassu, forming between them Priatinga bay; and between the latter island and Anajaer point, at nearly 10 miles farther on, is Punga bay.

Resolution shoal.—In June 1872, the steam ship *Lisbonense* touched on a bank, said to be in latitude 0° 44′ S., longitude 46° 25′ W., about 8 miles N.N.E. from the nearest part of Manejetuba island. This shoal was searched for in vain by H.M.S. *Dart* in September following.

The British brig *Resolution*, drawing 15 feet, was wrecked on a shoal reported to lie with Carauassu island bearing about S.S.W. ½ W., distant 10 miles, or in (approximately) lat. 0° 38′ S., long. 46° 36′ W. This position is about 12 miles north-westward of that given for the shoal on which the *Lisbonense* touched.

Japarigues islets.—Punga bay is distinguished from that of Priatinga by the two small Punga or Japarigues islets, which lie in the centre of it. Separated from each other by a small channel of about one mile in breadth, and lying in a line parallel to the track in running along the coast, the Japarigues islets never appear in line from a vessel off the coast, but are separated and distinct; this is important, as it prevents their being mistaken for the islands in Caïté bay, to the westward.

CAÏTÉ BAY.—This bay, the largest on this portion of the coast, is remarkable for three islands which divide it into nearly two equal parts, the northernmost being nearly 4 miles from the head of the bay. This latter island has on its northern side a sandy beach, terminated on the west by a small cliff, by which it is easily recognised. It is impossible to mistake them for the Punga islets, which always appear well separated, whilst the Caïté islets are blended together, and make almost as one island.

Caïté bay is bordered by the great bank which continues along the coast from Tamandua point. A break in this bank leads to an anchorage westward of the islands, but the channel is difficult to navigate, and only practicable for small craft. The river of the same name discharges itself into the southern part of the bay.

Maniji island is low and woody, and forms the western point of Caïté bay, which it separates from Coati Paru and Miriquiqui to the westward; these bays have for their common boundary a slightly projecting point named Japirica, or False Carro di Mato, which is distinguished from the land near it by its being rather higher, and by the reddish colour of its extremity. Also it is remarkable for appearing, particularly from the E.N.E., as an island, round at the top, and well separated from the main land.

Buckle bank.—At about 28 miles northward of Maniji point is a bank on which H.M.S. *Growler* found only 26 feet water. Its position is marked doubtful, and named Buckle bank, after the commander of that vessel.

Carro point, the west point of Miriquiqui bay is marked by a clump of trees, which are higher than those on the neighbouring coast; when seen at some distance from the north-east it has the appearance of a fortification, and is known among the pilots by the name of Carro di Mato.

Mount Piraussu.—At the distance of nearly 8 miles, S. by W., of Salinas village is mount Piraussu, rising above the land near it, and seen in clear weather when coming from the eastward.*

FALSE SALINAS BAY, lying to the westward of Miriquiqui bay, is remarkable from the white sand downs at its eastern point. Seen at a distance they look like breakers or vessels' sails; one of them in particular, separated from the three principal, appears like a boat's sail with the sun shining on it. A small hillock of white sand, about 2 miles eastward of Atalaia point, is remarkable.

SALINAS BAY, lies close to the westward of Atalaia point, from which the coast takes a south-west direction to Salinas village, situated on a wooded plain. The head of the bay presents a long sandy beach and some low sand-hills. From a distance, the white church of the town, about 60 feet above the sea, only is seen, but when within 6 miles, the red roofing of the houses can be distinguished.

The level land on which Salinas stands gradually decreases in height to the west, and terminates with a clump of high trees by which it will be known.

Salinas bay is bounded on the west by the island of Praia Grande, which separates it from that of Maracumo; this island is remarkable for having on it a very high tree, and also for a sandy beach on its north-east point.

Atalaia point separates Salinas bay from False Salinas. From the eastward it appears like a small round island, but it is soon seen to be connected with the mainland by small hummocks. A lighthouse stands on the point, and appears to be a good daymark from certain directions.

Shoals.—From Atalaia point, shallow water of 2 fathoms or less, extends in a N.W. by W. ½ W. direction for nearly 5 miles, its northern point being 2½ miles N.E. by N. from Praia Grande island. Between the distance of one and 2 miles westward from Atalaia point, the bank curves towards the shore, and passing close to that point affords deeper water closer in. Eastward of Atalaia point, the bank takes an E.N.E. direction for 2½ miles, and thence trends eastward parallel to the shore, at about that distance.

* *See* also Admiralty chart :—River Parā, No. 2,186; scale, $m = 0{\cdot}22$ of an inch.

At 3 miles N.E. by N. of Atalaia point is a shoal of 4¼ fathoms, with from 5 to 6 fathoms between it and the shore bank, and 9 fathoms outside.

Laplace shoal, having a depth of 18 feet, hard sand, on two separate heads, with 4 fathoms between, was discovered by a French war vessel of that name striking on it in August 1872, while swinging to her anchors; there are depths of 5 to 8 fathoms at one cable north-eastward of the spot. From the shoal heads, Atalaia point bears S.E. distant 3½ and 4¼ miles, and from the north-western or farthest head, the west point of Praia Grande bears W.S.W. A shoal of 5 fathoms lies about 2 miles N.W. by W. ¼ W. from Laplace shoal.

LIGHT.—On Atalaia point is a lighthouse, which exhibits a *revolving* white light, varied by a *flash every two minutes*, and should be seen in clear weather from a distance of 17 miles. The light shows steady for 70 seconds, followed by an eclipse of 16 seconds, then a flash for 12 seconds, and another eclipse for 22 seconds; total, 120 seconds.

Anchorage.—Vessels may anchor in Salinas bay in about 7 fathoms, with the lighthouse bearing S.S.E., and distant from 2 to 2½ miles.

From the uncertainty which exists regarding the shoals, vessels are recommended to approach Salinas bay with great caution.*

Pilots.—There is a pilot station on Atalaia point, and vessels bound for Pará and wanting a pilot will meet one of the schooners of the Pará pilot service off Salinas. This schooner in the day-time carries a white and red quartered flag, and at night, a white light at the mainmast. It is doubtful whether pilots may now be obtained as heretofore by sending on shore to Salinas village; if a boat is sent, she must be in time to cross the bar of the little river west of the village, at near high water, and to leave before one-third ebb, as the sea breaks heavily at other times. At night vessels requiring a pilot should burn a blue light.

Tides.—It is high water, full and change, at Salinas at 7h. 15m., and at the anchorage about 8h. 15m.

COAST.—Maranduba island is situated about 15 miles west of Atalaia point. Marapani point, the north extreme, is the western limit of the bay of the same name; it is distinguished by a small

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See caution on page 464.

hummock, and by its sandy shore and downs which, though not very high, are easily recognised, being the only point of the coast with that aspect, between Atalaia point and Pará river. Its recognition is important, because on its meridian is the most northern part of the great bank which borders the coast. The bank trends west northwestward from the meridian of Praia Grande island, passing nearly 4 miles due north of Marapani point, whence it trends west for 10 miles, and then turns W.S.W. for Curuza point.

From the meridian of Marapani point, the low north point of Cajetuba island is seen, which forms, with Maranduba island, the large bay of Piracumbana, at the head of which is easily distinguished the outline of Piracumbana island. Westward of Cajetuba island is the bay of the same name, which separates the island from that of Curuza, the western point of which terminates abruptly, and is higher than the land between it and Salinas. Tijoca point, westward of Curuza, is low, and terminates in a flat sandy beach.

These two latter points are separated by a deep inlet or river, named Curuza; it is of great importance not to mistake Curuza point for any of those near it.

Banks.—Between Cajetuba and Curuza points, and from 4 to 5 miles distant from them, are isolated banks, extending over a distance of about 6 miles, east and west, with depths of 2½ to 5 fathoms; and from 5½ to 7 fathoms between them and the shore bank, which is distant about 1½ miles.

One of these, a patch of 2½ fathoms, lies N. by W. ½ W. from Cajetuba point, and foul ground is reported to extend from 3 to 4 miles E.N.E. from it.

A bank reported to lie about 13 miles northward of Cajetuba point, is stated to be 2½ miles in length, east and west, by 1½ miles in breadth, with a depth of 2¾ fathoms, and to lie with Curuza point bearing S.S.E. ¼ E., Piracumbana point (east point of Cajetuba island) S. by E. ¼ E., and Braganza light-vessel W. by S. ½ S. Also about 5 miles to the westward, in lat. about 0° 18′ 50″ S., long. 47° 48′ W., the telegraph S.S. *Norseman* is reported to have struck on a shoal of 17 feet or less. This shoal is considered to be identical with it.

GENERAL DIRECTIONS.—Vessels from Maranham and bound to Pará, having cleared San Marcos bay, and with Itacolomi light bearing West about 12 miles, may steer about N. by W. ½ W., keeping in not less than 8 fathoms water, and bearing in mind that the flood tide sets W.S.W. 2½ miles an hour during springs, and 2 miles

at neaps, and that its strength increases as the depths decrease. The ebb tide sets N.E. at rather a less rate. Should a vessel be becalmed, and drift into less than 6 fathoms water, she should anchor. Having made good 50 miles, course may be altered to about N.W. to sight San João light, and to pass midway between it and the 1½-fathom shoal, reported to lie E. by N. about 23 miles from the light. Having run about 13 miles, the light or islands should be in sight.

The largest island of San João will appear in form like a white triangle, fronted by small hummocks covered with vegetation, which at a distance resemble islets; the lighthouse will be seen near its eastern end. In approaching the parallel of San João, the nature of the bottom will change, from white sand, to yellow mixed with red specks; the lead should be constantly hove.

If the weather is hazy and the land not visible, and the vessel be in 8 fathoms water, over yellow sand, she will probably be on the flat extending from San João islands. In continuing to the northward, the soundings will suddenly deepen to 16 or 17 fathoms, gray sand with black specks, and sometimes mixed with broken shells;* when a more westerly course may be steered, or along the land, keeping between the depths of from 11 to 15 fathoms.

By day the islands may be kept in sight, and approached to 8 fathoms. To this depth the soundings decrease regularly, but inside this depth they are irregular, varying from 6 to 2 fathoms to the edge of the bank. In passing Pirucana bay in 8 or 10 fathoms water, the morro Pirucana will be seen, which is the first prominent mark on the coast westward from San João; although of small elevation, it is easily distinguished in clear weather above the surrounding land. In continuing on in the same depths, Pria bay will be crossed, which will be known by the Samacas islands, should the weather be too thick to see the hills extending inland from the head of Gurupi bay. Cape Gurupi will also be known by the white sand at its foot.

Between San João islands and cape Gurupi the bottom is composed of gray sand with black specks; but on the meridian of the cape it is very fine black sand, being the only bottom of the kind on the coast, and which may serve to indicate a vessel's longitude; soon after the bottom again becomes gray sand with black specks. A vessel's position having been ascertained by sighting cape Gurupi, or from the nature of the bottom, the course may be continued to the westward,

* Lieut. de Kerhallet says, black gravel and small shells, the only soundings of th kind on the coast.

avoiding the reported position of Resolution shoal, 10 miles north-north-eastward of Carauassu island. The Punga islets will be recognised from the previous description.

On the meridian of Caïté bay the bottom is gray sand mixed with broken shells; sometimes the lead only brings up impressions of large shells. In the middle of the bay is a belt of mud extending in a north-north-east and south-south-west direction. The bank bordering the coast extends more to the north on the meridian of the east point of Caïté bay than to the westward; it will therefore be prudent to cross the bay in not less than 10½ fathoms of water at a distance of 8 miles from the islands. Steering to the westward, in not less than 8 fathoms water, Carro di Mato point and the sand downs of False Salinas bay will be seen, and finally Atalaia point and lighthouse. Between Manejetuba island and Atalaia point there are occasional white cliffs.

Between San João islands and Atalaia point, a vessel should not stand into less than 8 fathoms water, as in a less depth the soundings are irregular, and it is dangerous. This part of the coast is imperfectly surveyed, and should be approached with great caution, and generally not nearer than 7 or 8 miles. The deposits from the Amazons are said to form banks which in their turn are washed away again; some of these banks are said to be found at a distance of 10 or more miles from the land. The patches of discoloured water met with are not always indications of shoal water, but they should be approached with caution. The fresh water of the Amazons is sometimes seen off cape Gurupi. On a low and uniform coast like this, the soundings are the surest guide, and the lead should be kept steadily going, and the nature of the bottom studied.

Having sighted Atalaia point, it should not be approached in a vessel of large draught nearer than 6 miles, or in 10 fathoms water. The pilot schooner should be off here. If having to wait for a pilot for Pará, she can anchor in about 7 fathoms, muddy bottom, with Atalaia lighthouse bearing S.S.E. about 2½ miles distant. From the uncertainty which exists in the positions of the shoals off Salinas bay, vessels should approach with great caution.

The Tides along the coast, from the San João group to Atalaia point, are sometimes felt at a distance of 20 miles from the land; the distance to which they extend depends much upon the direction of the wind and depth of water; the streams are stronger close to the land and in shallow water; but as a general rule their influence is not felt at more than 6 or 8 miles from the coast.

The flood near the coast runs west-south-westward, towards the bays, at a mean rate of $2\frac{1}{2}$ miles an hour during springs, and $1\frac{3}{4}$ miles an hour at neaps. The ebb sets east-north-eastward at the rate of $1\frac{3}{4}$ miles at springs, and one mile at neaps.

Westward of Atalaia point, in about the track of vessels from Maranham to Pará, the streams appear to set about parallel to the line of coast, but it is advisable to guard against an on-shore set, during the flood.

It sometimes happens, however, during the months of March, April, and May, that the strength of the ebb exceeds the flood in the same degree as the flood exceeds the ebb during the other months of the year. *See* also page 476.

The difference between the strength of the flood and ebb tides is the result of a general set to the westward of from 18 to 24 miles a day during the greater part of the year; but during the months of March, April, and May, the set may be to the eastward at the same rate.

CHAPTER XIII.

THE AMAZON (AMAZONAS).—RIVER PARÁ TO CAPE NORTH.

Variation in 1893.

Pará river - -	4° 40′ W.	Cape North - -	4° 0′ W.

The AMAZON (AMAZONAS).*—The forests of the Amazon contain a wonderful variety of products; its virgin soil is capable of yielding coffee, sugar, rubber, cotton, and other valuable products in enormous quantities, while the Andes with their wealth of minerals and fleeces are included in the Amazonian watershed. The river abounds in fish, many of which are of the most delicious kinds; and turtles of an excellent quality are numerous. The Amazon traverses regions which are inhabited by numerous tribes of savages. Large alligators are seen stretched motionless in the mud, like trunks of trees.

The mouths of the Amazon, between Tijoca point and cape North, extend over a space of 180 miles. One great feature of the river is that it has no delta of accumulated mud extending into the sea, like the Mississippi, the Nile, and the Ganges: yet it carries an immense amount of mud in its waters. It is said, however, that the Amazon once extended 300 miles beyond the present mouths, and that therefore the ocean is rapidly encroaching on the northern continent of Brazil.

Climate.—The climate of the Amazon is generally healthy' though several of the localities under unfavourable circumstances are unhealthy and subject to endemic disorders, such as intermittent and pernicious fevers, dysentery, and catarrhal and nervous affections.

Temperature.—The temperature of the coasts of the province of Pará and in the river Amazon varies between 70° and 92° during the day, and between 67° and 72° during the night; the air is cooled by the vicinity of large water-courses and lakes, as well as by frequent and periodical rains, almost always accompanied by violent squalls. The difference between the temperature by day and that by night is very great; the refreshing coolness of the night is dangerous if indulged in too freely without taking any necessary precautions.

* *See* Admiralty charts:—Cape North to Maranham, No. 1,803, and South Atlantic, western portion. No. 2.202 *b*; for table of distances between important places on the river, *see* page 511.

Electricity.—There is not, perhaps, any part of the globe where electrical phenomena are produced with greater frequency and intensity than on the coasts of Pará, and especially in the river Pará, and that of the Amazon. Nothing, indeed, can express the force with which these phenomena sometimes appear; houses, vessels, the earth itself trembles at every commotion as if shaken by an earthquake; and the sky, the colour of bitumen, is incessantly broken during the storms by the lightnings, which sometimes illumine the whole horizon. It is seldom, however, that the lightning affects the town of Pará, the churches of which, with their high spires, seem as if they must be struck every day. The large trees in the neighbouring forests, doubtless, serve as conductors, for it is on them that the electric fluid generally descends.

The Seasons.—The year here is divided into two seasons, the rainy or winter, and the dry or summer season. The former begins generally in January and ends in June; the latter begins in July and ends in December. In the winter, the rain sometimes falls without interruption and very heavily for a whole week, during which time the sun is rarely seen. The river and its affluents begin increasing from the commencement of this season, and in December the large lakes are united with the rivers, and in their course carry along an abundance of vegetable matter, of entire trees, and sometimes of floating islands torn from the banks.

Then, the water of the rivers near the lakes is unwholesome and dangerous, and is only fit to drink by filtering, or by the immersion of a red-hot iron, the effect of which is to neutralize the vegetable matter. The waters continue increasing till the rains are over. When the rains have ceased, the river, which has overflowed all the low lands, soon falls to its bed, and leaves as traces of its passage a fertilizing soil, and thousands of trees it has washed down, and which are carried off into the sea at the next overflowing.

Winds.—In the summer the winds blow continually from the east, moderately during the months of July and August, but very strong during the other months of the season. They are called general winds. It is then that the daily squall is most violent, and sometimes acquires great force. The winds in summer veer from about E.N.E. to E.S.E. As the general winds blow up the river, that is the best time for ascending the Amazon. The country boats, when going to Pará from the upper part of the river, drift along without sails, being quite incapable of working against a contrary wind, which is often very strong.

In winter, the general winds are only felt at long intervals; the calms predominate, and are only interrupted by heavy squalls of wind from the N.E. round by west to S.W., accompanied by torrents of rain. The navigation upwards then becomes slow, whilst the descent of the river becomes more rapid from the increased power of the currents.

Currents.—Height of river.—The waters of the Amazon rise during six months, and then, having reached their greatest elevation, fall during the other six months of the year. During August and September the snow on the Andes begins to melt, but its influence is slowly felt by the Amazon. It begins to rise in the month of November; the inundations in the lower parts of the river take place in January, February, March, April, and May; the winds from the north-east which then prevail, and blow strongly at the mouth of the river, retard the stream of water from the river, and contribute greatly to the inundations.

The rise is from 30 to 50 feet, and at times the whole basin is under water. By a singular operation of natural causes, the water in the southern tributaries of the Amazon is high, while that in the northern is low, and *vice versâ*. In the Madeira, a southern tributary, the water is at its highest in April, the difference between high and low river being about 50 feet.

Off the mouth of the Amazon, the surface water of the Atlantic ocean, continually blown towards the west by the general winds, causes a current to the north-west, which generally attains a rate of 2 miles an hour, and sometimes as much as 4 miles. At the right angle of the stream of the Amazon the current trends towards the north, produced by the mass of water projected towards the north-east from the river; but it soon attains the mastery, and carrying along with it the water thus projected, acquires greater force. The stream of the Amazon, which is black, discolours the ocean for a distance of 50 miles from its mouth.*

Tides.—The tides in the vicinity of the Amazon are subject to so many variations and irregularities, that it is difficult to denote precisely what course they follow; their exact duration, height, and strength, all depend on the force of the wind, on the abundance of rains, or capricious changes in the direction of the current. They may be divided into two parts; those which occur between Maranham and the mouth of the Amazon, and those between the east mouth

* Colonel Sabine states that he found the stream of the Amazons in blue water in lat. 5° N. and long. 50¼° W.

of the river and cape North. The first are regular, and though affected by the various rivers, they follow the general law of tides of six hours.

Their direction and strength vary according to their distance from the land; the flood tide generally runs S.W. near the coast, and W.S.W., or more westerly, at some distance from it; it has a mean rate of 2½ miles an hour near the land, which diminishes as the distance from the coast increases. The ebb tide sets about E.N.E. near the coast at the rate of 1¾ miles an hour, and trends towards the north with diminished strength, in proportion to the distance from land. The rise of the tide varies according to the localities; beyond 4 miles from the coast, where the local influences have no power, the rise is 14 feet at springs, and 10 feet at neaps.

In the second part, the flood tide, which runs to the S.S.W. near the mouth of the Amazon, inclines towards the S.W. and W.S.W. in proportion to the distance from the land; and the ebb tide, which sets first N.E., inclines towards the North and N.W. before it is united with the general current. A difference of 2 or 3 hours in the establishment of two places far from land and only 12 miles apart, and a rise of only 6½ feet 12 miles from a point, where at the preceding tide 29 feet had been observed, are two anomalies in the tides quoted as most remarkable amongst others less striking, though numerous on this coast.

As soon as the flood tide begins, the sea near Marajo island rises almost suddenly; during winter it generally rises 16 feet at springs, and as much during the first two hours as the remainder of the flood; it runs at the rate of about 6 miles an hour. On the north side of the river, between cape North and Macapá, the rate is from 8 to 10 miles an hour.

Observations have shown with certainty that there is a difference of level between the Amazon, and the sea; for during the rainy season, when the stream of the ebb tide should be the strongest, the flood tide has the greatest velocity. The stream of the flood tide, from the mouth of the river, as far as 90 or 120 miles up the river, begins in December to be stronger than that of the ebb. At cape North, during January, February, March, and April, the flood runs more than 8 miles an hour at springs, and at the ebb from 2 to 4 miles. In May, the streams are of equal strength; after May the ebb begins to be the strongest. In August and September the flood is weak, while the ebb runs 5 or 6 miles an hour, but it loses its velocity gradually in October; and in November, the period at which the north-east winds begin to blow, the strength of the streams are again equal

From this it may be concluded that the waters of the sea are higher than those of the river every time that the flood stream is stronger than that of the ebb, or from December to April, inclusive, when the winds blow strongly from the N.E.; and also that the waters of the sea are lower than those of the river, or at least have the same level when the ebb stream is stronger than the flood, which is the case from June to October when the winds are from E.S.E.

The plains of Brazil, on the right bank of the river, are generally higher than those of Guiana on the left bank; therefore the overflowing waters of the Amazon spread over the latter, and are increased by the water from other rivers, and that caused by rain. Thus the immense plains of Guiana become at last almost entirely under water.

The tides have been felt at Pauxis, 600 miles from the sea, and it is inferred, from the time the rise of the waters require to travel this distance, that there must be a succession of tides in the river at all times. The regular influence of the tides is felt as far as Obidos, 520 miles from the sea, gradually increasing in height as the sea is approached.

The Bore or Pororoca is a tidal phenomenon which sometimes occurs in the western branch of the Amazon at about spring tides.*

The bore confines itself to the shallows and affluents, and is not felt in depths over 4 fathoms, except by an increase in the velocity of the stream, so that there is no danger to vessels keeping the main or deep channels.

When it is expected, the coasting craft are stated to confine themselves to the sheltered anchorages found within the mouth of Araguary river and at Maraca island. It is felt more particularly on the northern side of approach or between Maraca island, situated about 80 miles northward of the entrance, and Macapa at about the same distance within the entrance; nearly the whole of which coast comprises low islands fronted by shallow sandbanks. It runs, however, with considerable velocity on the opposite side of the river, as, some 30 years ago, Caviana and Jurupari islands were both divided by the strength of the current, and the channel between those islands rendered unnavigable except by boats.

When it makes its appearance, which is at the lowest of the tide, a roaring sound is heard at a distance of from 3 to 6 miles; as it

* Communicated by the "Amazon Navigation Company," Pará, 1890.

approaches the noise increases, and soon a head of water, estimated to vary from 5 to 12 feet in height with a breaking face, is seen occupying the whole of the shallow water off Maraca island and Araguary river out to about a depth of 4 fathoms. Its velocity is estimated at from 10 to 15 miles an hour, being strongest and most dangerous in the months of January to June, and at the equinoxes, when the wind is north-eastward, and it carries away in its course everything that is opposed to it.

When the wave has passed the water is nearly high, and the stream of flood continues (from 8 to 10 miles an hour in the vicinity of cape North, from January to April, and less than half that amount in August and September), but without perceptibly raising the level of the water in the vicinity of cape North, which is said to acquire all its height (reported as 40 feet) in the short space of about ten minutes.

On the opposite side, off Marajo island, the bore raises the water to mean water level (about 8 feet), the remainder being acquired during the remaining hours of flood.

There is no bore in the Pará, the eastern mouth of the Amazon; but, in Guama river, near the village of Pernambuco, about 25 miles above the city of Pará, the bore makes its appearance near full and change, and raises the water from 5 to 15 feet in a few minutes, whence it rushes up the Guama, dividing at the junction of Capim and Urucuritene rivers, the greater portion of it going up the Capim.

The same thing occurs in Guajara river, situated close southward of the Guama.

AMAZON EASTERN MOUTH—RIVER PARÁ.—The estuary of the river Pará, the eastern mouth of the Amazon, lies between Tijoca point, on the east, and cape Magoari, the north-east point of Marajo island, on the west; it is about 34 miles in breadth, and from a position midway, the coast on either side cannot be seen. It is encumbered with numerous banks, and great attention to the lead is requisite. Considerable changes in the outlines of the coast near the entrance of the river have taken place since the survey by M. de Montravel in 1846, mostly through deposits from the rivers: banks formerly just showing at low water, are now small islands covered with luxuriant vegetation. From this it would appear probable that there are many other shoals having less water than is shown in the chart.

These banks or islands may be divided into three principal groups, the eastern, western, and central. The eastern group is composed of the Braganza, the Coroa Nova, and the Coroa Gaivotas; the latter is part of the great coast bank which continues south-west from Tijoca point.*

The land on either side of the river is low, and the eastern shore is one uninterrupted scene of forest green skirting the water's edge. The banks of the river are muddy, affording little facility for landing; and where they do admit of it, houses are generally erected. The water is extremely muddy, of a dingy orange brown. Many thatched and cabined canoes of the country are seen, and other small craft with their thin cotton sails, engaged in the river trade, having some resemblance to Chinese vessels.

BRAGANZA BANK, the most eastern of the group, is formed of hard sand ridges, on a bed of stiff mud; some of which, particularly those bordering Dentro channel, uncover at low water. The west and south sides of the bank uncover nearly its whole length at low water, and is steep-to; the north and east part forms a flat, over which there are from 3 to 6 fathoms water; the east side is steep and from it the water deepens suddenly from 5, to from 12 to 18 fathoms.

The north extreme lies N. ½ W., distant about 7½ miles from Tijoca point; the south-west, named Espadon, N.W. 6½ miles from the same point; and the south-east North 4 miles. As the bank lies in the usual passage for entering the river, and the sea breaks on the north-west side of it at all times of the tide, it is important to make the breakers, as they serve as a mark.

LIGHT VESSEL.—A light vessel is moored in 15 fathoms about 1½ miles north-westward of the north side of Braganza shoal, with Guavas islet bearing S. 10° W., and the north-east extreme of Curuza point S. 30° E. The light vessel is painted red, has two masts, and exhibits a *fixed* white light, visible from a distance of about 4 miles. The position of this vessel cannot be depended upon as she frequently drifts, and in stormy weather moves under the lee of the banks, and sometimes enters the river.

Pilots.—Fourteen men are engaged in the pilot service; they possess four schooners, one of which is always to be in the vicinity

* *See* Admiralty chart:—River Pará, No. 2,186; scale, $m = 0{\cdot}22$ of an inch, with plan.

of Salinas bay. This schooner in the day-time, carries a white and red quartered flag, and at night, a white light at the mainmast. Occasionally, pilots are met with at the light vessel, and also at Taipu point. Too much confidence must not be placed in them. Pilotage is compulsory.

Buoys.—A large white buoy, visible from a distance of about 3 miles, is placed on the north-east side of Braganza bank in 8½ fathoms water, with Tijoca point bearing S. ½ W. about 7½ miles.

Foul ground.—The master of the steamship *Berkshire*, drawing 17½ feet, reports having struck upon a shoal of sand and mud, at the entrance to Pará river, distant 6 miles on a N. by E. bearing from Braganza light vessel. The shoal is described as being extensive east and west, and narrow north and south, having a general depth of 19½ feet, with 18 feet in some places, and deep water around. This shoal is said to be extending southward, a depth of 17 feet with 11 fathoms at a short distance, having been found about 4 miles north of the light vessel.

The Commander of the United States and Brazil mail steam vessel *Alliance* 1889, reports having touched lightly on a shoal in lat. 0° 24¾′ S., long. 47° 52′ W. (approximate) with Braganza bank light vessel bearing about S. 85° W., distant 7 miles. The Alliance shoal is said to have a depth of 4 fathoms on it, and to extend not more than one-eighth of a mile in an east and west direction. A shoal with 15 feet water is said to lie with the light-vessel bearing S. 68½° W. distant about 10 miles, lat. 0° 24¾′ S., long. 47° 49½′ W. (approximate).

It is further reported, that, between the bearings, North and N.E. by E., at a distance 8 to 10 miles from the light vessel, the ground is all foul.

Caution.—From the incomplete nature of the original survey, and from the great changes that take place on a coast of this nature, the details of the chart of the Pará entrance cannot be now regarded as trustworthy.

Coroa Nova lies S.S.W. of Braganza bank, and is separated from it by Pozo channel of one mile in breadth, with depths of from 7 to 12 fathoms. The north-east part of this bank is continually changing its position, and the tide runs at the rate of 5 or 6 miles an hour. This shoal has extended some distance to the westward.

Coroa Gaivotas, about one mile southward of Coroa Nova, is a bank of sand almost uncovered at low water, and extends towards the coast bank, leaving between a narrow passage navigable for small craft. On Coroa Gaivotas stands an island covered with trees, about 50 feet high. The Cassard channel between Coroa Nova and that of Gaivotas is winding, shallow, fit only for very small vessels.

A LIGHT VESSEL (*Gaivotas*) lies in about 6 fathoms water, with Braganza bank light vessel bearing N.E., and west extreme of Gaivotas islet E. by S. ¼ S., and exhibits a *fixed red* light, visible 7 miles. This vessel may be passed on either side.

Tijoca bank.—At about 2½ miles north-west of Braganza bank is that of Tijoca, lying N.N.E. and S.S.W., 5¾ miles in length and 1½ in breadth. It is composed of three hard sandy ridges, each about a mile in extent, and 2 miles apart, with depths between of about 3½ fathoms water. The northern ridge, named Cabeza do Norte, has a depth of 6 feet at low water; Cabeza do Meio, the centre ridge, has 9 feet; and Cabeza do Sul, the southern ridge, has about 6 feet.

Buoy.—A red conical buoy, with staff and vane, is moored on the south end of Tijoca bank, nearly one mile S.S.W. of Cabeza do Sul.

Tijoca bank is steep-to all round, and Dentro channel, between it and Braganza bank, has 7 to 15 fathoms water. With any sea, there is usually a ripple on this bank appearing like breakers.

San João bank, with 3½ to 4½ fathoms, and 5 to 8 fathoms around, extends about W.S.W. and E.N.E. for about 3¼ miles. It is situated 5 miles westward of Tijoca bank, with 7 to 8 fathoms water between.

Adonis banks are two dangers about 6 miles northward of San João, and separated from each other by a narrow channel having 7 fathoms water. The eastern bank is about one mile in extent, with depths of 2¾ to 4½ fathoms. The western shoal is about 2 miles long, and has 2¼ to 3½ fathoms. There are depths of 7 to 9 fathoms between these and Magoari bank at about 2 miles westward, and 5½ to 12 fathoms between them and Tijoca bank, at 7 miles eastward.

Monjui bank lies about E.N.E., distant 3 miles, from Adonis banks. It extends E.N.E. and W.S.W., about 5 miles in length, and at its west end is rather more than one mile in breadth, from which it diminishes eastward. There are depths of 2½ to 5 fathoms water over it.

Magoari or Santa Rosa banks, forming the western group of banks in the entrance of the river, consist of a number of sandy ridges, and, although separated by a narrow channel, may be considered as part of the bank bordering cape Magoari, which, broken in places, continues along the coast of Marajo island until southward of Coroa isle. These ridges extend eastward from the cape for a distance of 14 miles, with a least depth of 1½ fathoms water, and on which, in fresh breezes, the sea often breaks; but at times their positions are not seen. From the eastern extremity of these banks, cape Magoari is distinctly seen from the deck of a vessel.

Tide.—The flood tide here runs about W.S.W., and the ebb E.N.E.

Coroa Kiriri bank, southward of Magoari, borders the shore of Marajo island, from which it extends off to a distance of 16 miles, its eastern extreme being about 17½ miles in a W.N.W. direction from Tijoca point. It is said to uncover at low-water springs, and shows generally in ordinary tides.

DENTRO CHANNEL.—Braganza bank is separated from that of Tijoca by a passage about 2 miles in breadth carrying from 7 to 15 fathoms water, over fine gray sand, named the Dentro channel. It is always used for entering the river Pará, and notwithstanding the limited space for working to windward, by vessels of more than 15 feet draught in leaving.

Monjui channel.—The passage between Tijoca and Magoari banks is named the north or Monjui channel, and is generally preferred for vessels under 15 feet draught in leaving.

Southward of Braganza bank is Pozo channel, now seldom used in consequence of its banks having altered, and the tide sweeping across them with great velocity. Cassard channel between Coroa Nova and Coroa Gaivotas is winding, shallow, and not fit for any but small vessels.

EASTERN SHORE.—Taïpu point.—Between Tijoca point, the eastern entrance point of Pará river, and that of Topari, at about 6 miles to the south-west, the coast forms a bay, cut by several rivers or channels which divide the land into numerous islands. Topari point is remarkable by three large trees which overtop the surrounding vegetation, and appear like hummocks. It may be said to form, with that of Taïpu point 4 miles to the west-south-west, the estuary of the river San Gaëtano, where many tributary rivers also empty

themselves. The Coroa Gaëtano extends as far as Taïpu point, covering the estuary of the river, where close to the entrance are two islets named Rasa and Ratos.

The land about Taïpu point is seen from a position to the northward of Braganza breakers, appearing like a low island, but on a nearer approach like two elevated hills, and joining the land to the south-south-west. Southward of these hills is a large tree, resembling a tower, near the north point of the mouth of the Fouro de Bareta. This tree is a good mark for Vigia channel, which is also easily known by its abrupt point appearing detached.

Correio bank, of hard sand, is dry in places during low spring tides, and on which occasionally the sea breaks heavily. It extends along the coast, from which it is partly separated by a narrow channel about half a mile wide, from northward of the large tree just mentioned to the south-east of Carmo point. To clear it, keep Carmo point eastward of South.

Vigia channel, formed by the island of Colares, is almost closed at the north entrance by Correio bank, which narrows its breadth to about 2 cables. The least depth through the channel is about 3 feet at low water, and in places there are 5 and 6 fathoms. The village of Vigia stands on the east side of the channel at about 3 miles within the entrance.

Colares island is about 13 miles in length, 7 in breadth, and separated from the main by Vigia channel. It is more elevated than the land which precedes it to the north. Carmo point, the northwest extreme, appears perpendicular, caused by the trees on it, which have their roots in the water. At 6½ miles southward of it is the village of Colares, with a white chapel, standing upon a flat sandy shore, sheltered from the sea by a ridge of rocks, uncovered at half tide, and which form a breakwater for a distance of 1½ miles from the shore. At 5½ miles southward of the village is Cocal point, where the shore turns abruptly to the eastward. This part of the coast is skirted by several ridges of rocks.

LIGHT.—On Colares rocks stands a lighthouse, from which, at an elevation of 34 feet above high water, is exhibited a *fixed* white light, visible in clear weather from a distance of about 10 miles.

The lighthouse and the keeper's dwelling near it are painted white.

Bay do Sul.—Cocal point forms the north extremity of a large and deep bay, named the bay do Sul, which is joined on the north by Vigia channel, and on the south by the river San Antonio. The entrance is partly filled by a large ridge of sand, which is dry in places, and extends from the distance of about half a mile southward of Cocal point to within half a mile of the south shore of the bay. When the parallel of the village of Colares is passed, the south coast of the bay do Sul is seen, which terminates on the west by Marau point.

Pombas isle.—At about 4 miles eastward from Marau point, and close to the shore, forming the south side of entrance to the bay do Sul, is Pombas isle, round, woody, and at first appearing attached to the mainland. A ridge of rocks extends to the northward from the isle for the distance of nearly a mile, and along the shore to the eastward ; leaving between them and the ridge of sand extending from Cocal point, a narrow channel into the bay. The sea is here sometimes rough, especially with the flood tide.

Guaribas island.—At the distance of half a mile from Marau point is Guaribas island, low, and covered with brushwood. It is steep-to, with a clear narrow channel of 10 fathoms between it and the main. The coast from Marau point trends south-westward, and at the distance of about 4½ miles is Chapeo Virado point, where it trends to the southward for 3 miles to Musqueiro point, and then south-eastward, forming, with Barreiras island to the south San Antonio bay.

Tanheiras rocks.—Between Marau and Chapeo Virado points, at about half a mile from the shore, are Tanheiras rocks consisting of several ledges covered at high water, with shallow depths extending a mile to the westward of them. These are dangerous, and should be carefully avoided.

LIGHT.—Chapeo Virado light is shown from the outer extreme of the shoal south-west of the point, with the old light bearing N.E. distant one mile. The light is *fixed red*, visible in clear weather from a distance of 13 miles.

WESTERN SHORE.—Marajo island.—The western shore of the river Pará from cape Magoari, in the island of Marajo, runs almost south as far as the parallel of Carmo point. It is low, woody, and intersected by the mouths of several streams, the principal of which is the Igarapé Grande, which is about a mile wide, and

considered to be navigable for a great distance. The island supplies Pará with cattle and horses. In the rainy season it is much flooded. Almost all the streams on the eastern side of the island communicate with the lakes in the interior of the island, and the greater part are navigable for small vessels. At 1½ miles southward of the parallel of Carmo point is the village of Joannes, where the coast trends south-south-westward. At about 4 miles southward of Joannes is the village of Monsarras; and at 5 miles farther on, close to the coast, and on the parallel of Cocal point, is the low islet of Coroa.

LIGHT.—From a lighthouse on Joannes point is exhibited a *fixed* white light at an elevation of 40 feet above the water, visible in clear weather from a distance of 10 miles.

Coroa Morisoca.—From Coroa Kiriri, the great bank bordering the shore of Marajo island trends to the southward for about 25 miles, where it is broken at 4 miles from the shore. This part of the bank, named the Morisoca, is dry in places, forming shallow changeable channels through which the boats of the country pass; its southern part Coroa Morro is about 3 miles long, and from increased deposits has become an island, with stunted trees growing on it.

Coroa Secca.—At the distance of 6 miles southward of Coroa Morisoca is the north end of Coroa Secca, which extends to the southward for a distance of 5 miles, and is 2 miles in breadth. Its eastern edge is 7 miles from the coast of Marajo, and nearly midway between the two shores of the river; like Coroa Morisoca it is partly dry. This bank has extended considerably to the eastward.

Buoy.—A red buoy marks the south extremity of Coroa Secca bank.

Coroa Grande.—This sand-bank is partly uncovered, and extends 6½ miles from the coast between Coroa Secca and Coroa island, leaving between its east end and the south extremity of Coroa Secca, a deep channel nearly 2 miles in breadth. These two latter banks are steep-to.

CHANNEL to PARÁ.*—The entrance of the navigable channel leading to the town of Pará is between the shoal off Musqueiro point on the east, and those extending from Tatuoca islet

* *See* plan on Admiralty chart :—Pará river, No. 2,186; scale, *m* = 0·5 of an inch.

on the west, and is 1½ miles in breadth. The least depth to the town is 3 fathoms.

Tatuoca, a wooded islet, lies 3 miles S.W. by W. from Musqueiro point, and is the northernmost of a group of islands extending along the coast of the mainland over a distance of 20 miles, and forms the western side of the channel. From the islet, a ledge of rocks extends to the northward to the distance of nearly 1½ miles, some of which uncover at low water. Adjoining the south part of the islet is the extremity of a hard sand-bank, which extends northward from Jetuba island and partly dries at low-water springs.

Musqueiro point.—Magari river.—At about half a mile westward of Musqueiro point, on which there is a red tiled factory, is a shoal with 1½ fathoms water, and 7 fathoms between it and the point. From Musqueiro point a bank of sand extends across San Antonio bay to the south-west end of Barreiras island, at the entrance to Magari river or channel. There is a factory and an iron pier on both the points of entrance to river Magari. From Pinheiro, the south point of entrance, the coast trends southward as far as the town of Pará. At the distance of 2 cables from the chapel on Pinheiro point, is a rock with 11 feet at low water, and a depth of 6 fathoms between the rock and the point. About midway between Pinheiro point and Lapaca at 1¾ miles south of it, there is a shoal, from which a church near the Custom House at Pará is seen open eastward of Nova island and a brick kiln at Topaca bears S.E. by E ¼ E. distant about 4 cables. Being southward of Pinheiro point, the towers of the principal churches of the town are seen, and soon after the other buildings.

Nova island.—Southward of Pinheiro point the navigable part of the channel to Pará is contracted on the west side by Nova island, and the island and mud-banks extending from it parallel to the shore, and the east side by the banks which more or less border the shore at a short distance.

Fort da Barra.—At three-quarters of a mile south-east of Nova island is the isolated and circular fort da Barra, nearly 2 cables from the shore. From 4 to 11 fathoms will be found in the channel between Musqueiro point and fort da Barra. A small fixed light is shown from the fort. (*See* page 489.)

Rocks.—At about a quarter of a mile north of fort da Barra is a

rock with about 6 feet on it, and which being near the channel, must be carefully avoided.

At about one mile S. by W. ½ W. from fort da Barra, and about a quarter of a mile from the shore near the brick kiln of Val de Caens, is a rock having 9 feet water; it is marked by a conical red buoy on its north-east side. The rock is steep-to, and between it and the shore there is a depth of 6 or 7 fathoms.

Also, a small rock visible at low water lies S.W. by W. from Penhacova chapel, at about 2 cables from the shore, with from 5 to 6 fathoms inside the rock.

Red buoys mark the outer edge of a sand-bank with 9 feet on it, off Penhacova chapel. None of these buoys are to be depended on.

Oncas island.—Southward of fort da Barra the channel appears to widen, and here, at a distance of 2 miles from the mainland, is the northern extremity of Oncas island, which extends to the southward past the town of Pará. The space between the island and the main is divided into two channels by the narrow bank of mud, which extends to the southward from Nova island past the town of Pará. This bank has from about 3 to 12 feet water over it. The coast of the mainland continues to be bordered more or less by a bank.

PARÁ, or Santa Maria de Belem, the capital of the province of Grand Pará, was founded in 1615, and stands on an elevated point of land on the right bank of the estuary of Pará or east arm of the Amazon, at about 70 miles from its entrance. The city is regularly built and well lighted; the majority of the streets are macadamized, and kept in good repair. The houses, with their whitened walls and red tiled roofs, are substantially built of stone; few however have more than two storeys, and many of them only one.

There are public squares, a palace for the President, a handsome cathedral, which was commenced building in 1720, and is said to be the largest in the republic, several churches, numerous convents, primary schools, an hospital, marine and military arsenals, theatre, botanical garden, &c. Pará fronts the river, and in its rear there is a beautiful shaded walk. The Estrada das Mongubeiras (the Monguba road) about a mile long, extends from near the naval arsenal, on the river side, to the Largo da Polvora at the eastern extremity of the city. It is a magnificent avenue of silk-cotton trees, and it is intersected by avenues leading from the Palace-yard and the Largo do Quartel.

The naval arsenal has some fine buildings, but appears to be only used for the small squadron employed on the Amazon. Frigates have been built here; wood material is plentiful, and of the best description.

Beyond the actual precincts of the city a dense forest commences. The climate of Pará, though hot and liable to thunder-storms and heavy rains, is healthy for Europeans. The ground is of a porous nature, and soon dries after the heavy rains. The population in 1884 was about 60,000. A large proportion of the population is composed of Portuguese, and there are a few English, Germans, and Americans. The native population consists principally of Tapuias or Indians, and mixed races. The interior of the province may be considered as inhabited entirely by Indians.

Communication between Pará and the other ports of the empire is kept up by steamers three times a month belonging to a company at Rio de Janeiro, which receive a large subvention from the government. A line of steam ships between new York and Rio de Janeiro calls at Pará twice a month. There are also two regular monthly lines of steamers from Havre and Liverpool.

Other companies, having in all about 32 steam vessels, varying from 20 to 600 tons, are established for the purpose of the Amazon river traffic, of which the principal station is Pará. These steamers, with numerous small craft and canoes, may be considered the only means of communicating with the interior; *see* page 511.

Submarine telegraph.—Pará is connected with Pernambuco by submarine telegraph; and most of the principal ports on the east coast of Brazil are connected in the same manner. A red buoy placed off Penhacova marks the position of the cable.

Supplies.—Water is supplied to shipping by boats, but it is dirty and bad. The water of the river is good during a part of the year, but unwholesome and dangerous to drink in the months of July, August, and September; it can then be obtained from a well, convenient to the beach at Pinheiro point, or by digging wells at half tide on the flat beach of San Antonio bay; the wells are destroyed during the next tide. When taken from alongside, the water soon settles, leaving two or three inches of sediment in each tank, but it will not long keep good. Coal and other supplies may be obtained.

Coal.—From 4,000 to 5,000 tons of coal are kept in stock at Pará. Coaling is by lighters and small baskets, and about 100 tons are

usually put on board per day. To coal with dispatch, all labour would have to be provided by the vessel requiring it. Very little interruption.

Gridiron.—There is a gridiron for cleaning ships' bottoms, capable of taking a vessel of 600 tons and drawing 7 feet water.* At the river Una, 2 miles north of the town, there is a convenient place for heaving a vessel down.

LIGHTS.—A small *fixed* light, established by the Amazons Steamship Company, is situated on the south-west point of Coutejuba island, and another on fort da Barra in the channel to Pará, visible about 7 miles. Too much reliance must not be placed in these, or other lights on this coast.

Anchorages.—The anchorage off the city of Pará is between the church of San Antonio at the north end, and that of Merces near the centre of the town; in 2 to 3½ fathoms, distant about half a mile from the shore. Vessels should moor.

H.M.S. *Amethyst* found 3¾ fathoms, at low-water spring tides, with the cathedral bearing S. 4° E.; custom-house S. 45° E.; and fort do Barra N. 15° E.

There is good temporary anchorage off Bay do Sul, in from 5 to 7 fathoms, with Pombas island bearing South; also off Musqueiro point, in from 3½ to 5 fathoms, with that point bearing about N. by E.

Tides.—It is high water, full and change, in the Dentro channel at 10 h. 50 m. Springs rise 10 feet; the flood sets to the S.W. from 2½ to 3¼ miles an hour; the ebb sets to the N.E. at the same rate. At Pará anchorage, at 12 h.; and at Onças island, at 1 h. 20 m.; springs rise 11 feet. The flood tide runs at from 2¾ to 3½ miles an hour; that of the ebb from 2½ to 3¼ miles. In winter, whilst the winds blow from the north, the flood lasts longer than the ebb, and runs with greater strength; but during the rest of the year the ebb tides last longer, and are more rapid than the flood.

The difference of level is caused by the influence of the waters of the Guama and Guajara. The time of high water, and the strength of the tide, however, vary according to the force and direction of the

* It is advisable to take precautions against rats getting on board a vessel, for the river is infested with them.

wind, and the quantity of rain that falls in the upper part of the rivers.*

WINDS.—In the summer the mornings are generally calm, or a light breeze blows from East to E.N.E., and by degrees veers to the northward; in the afternoon it blows from N.E. to N.N.E., and often fresh until 5 or 6 p.m.; it then falls calm, which lasts till the morning. In winter the breezes are irregular, and during the rainy season there are light squalls and calms. These squalls are variable, blowing from north to south. When at this season the regular breezes set in for a time, the weather improves also, and is fine during their continuance. The temperature varies between 70° and 90° Fahrenheit; it rarely descends lower or rises higher than these two limits. Probably there are few places where so much rain falls annually as at this town.

DIRECTIONS for ENTERING the RIVER.†—Having obtained a pilot from the pilot schooner off Salinas, steer to the northward until in 11 fathoms water, and then W. by N. along the coast in from 10 to 14 fathoms water, making due allowance for the tide, and passing about 6 miles north of Cajetuba point. When on the meridian of Curuza point the breakers on the Braganza bank will be seen bearing about W. by S., distant about 7 miles. Bearings now taken of the east extreme of Cajetuba, and the west part of Tijoca point to the south-west, will determine the vessel's position, and show the effect of the tide, for which on the flood a point to the north should be steered.

If the vessel's position be satisfactory, the course W. by N. may be continued to be made good, in not less than 8 fathoms water, which will be found north-eastward of the flat extending E.N.E. from the Braganza, and which will increase to 10 fathoms north of it. When abreast the position of the large white buoy off the north side of Braganza bank, or when Tijoca point bears South, steer round the breakers, in from 12 to 15 fathoms through Dentro channel, until Espadon sand-bank or breaker is in line with Tijoca point bearing S.E. ½ S.; then steer S.W. ¼ S., which will carry a vessel westward of the Coroa Nova and of all dangers. The soundings will decrease in the river to the south-westward to 6 or 7 fathoms.

* The tide has been said to attain at times a velocity of 7 knots an hour. H.M.S. *Avon*, 1880.

† Too much dependence must not be placed in the depths of water, which are subject to constant change, as given in these directions.

If the breakers on Braganza bank are not seen in consequence of a calm, high water, or the sun being too low in the horizon, great caution must be exercised in approaching it; and when in Dentro channel, if the vessel should be in less than 9 fathoms the land of Tijoca being distant, and the islets of Rasa and Ratos out of sight, the vessel will be too far westward, near the Tijoca bank, and a more southerly course should be taken until Tijoca point bears eastward of S.E. If those islets are in sight and well open, bearing westward of South, with the land of Tijoca very distinct, and the depth decreasing, a vessel will be too near the edge of Braganza bank, and should steer more to the westward.

The above directions are given as the Braganza light vessel is often out of her place, but assuming her to be in the correct position, when she is sighted keep her on a West bearing, and passing north of her, steer S.W. as soon as she is rounded. Great attention must be paid to the tides, as in Dentro channel, the ebb sets towards Braganza bank, and the flood from it.

It would not be prudent for a vessel to enter this channel during night or in a calm. It would be better to anchor before reaching it, even at the risk of losing an anchor. The bottom is everywhere fine gray sand.

Assuming the vessel to pass in the centre of Dentro channel and about 1¼ miles from Espadon breakers, a course S.W. ¼ S. will, guided by the chart and lead, lead about one mile clear of all danger. If the soundings, before reaching Bay do Sul, exceed 8 fathoms, the vessel will be too far westward. Southward of the bay the water deepens.

Do not bring Guaribas islet to bear northward of N.E. by E. ½ E. until Musqueiro point bears S. by E., when the reef extending from Tanheiras rocks will have been passed. Then steer so as to give Musqueiro point a berth of one mile, passing eastward of Tatuoca isle and the dangerous shoals lying north of it, and then S. by W. for Pinheiro point, on which there is a factory, making allowance for wind and tide. Having passed Pinheiro point at the distance of half a mile, keep along the coast for the passage between Nova islands and fort da Barra, passing about 1½ cables westward of the latter, and avoiding the rock a quarter of a mile north of it. From fort da Barra steer towards the western part of the town, passing half a cable outside the red buoys, if in position, or at half a mile off the shore. If the wind be light, care must be taken to guard against the flood tide,

which sets strong to the south-west between the Una river and the point of the town.

The mark for being near the edge of the bank, extending from Nova island to the anchorage, is the west angle of the hospital, a white house standing in the west part of the town, in line with the church of Carmes, in the south-west part of it. Anchor off the town as before directed.

DIRECTIONS for leaving the RIVER.—A vessel leaving the anchorage of Pará should be under weigh at high water, and if of large draught may stand to the westward into 4½ fathoms water, or until the hospital and church of Carmes are in line; but into 3½ fathoms if of light draught; and to the eastward as far as a line joining the cathedral and fort da Barra. When the north part of Arapiranga island is seen between Miriam and the island southward of it, a vessel will be northward of the bank extending north from Nova islands, and may stand towards the islands into 4½ or 5 fathoms.

A vessel will thus probably arrive as far as Musqueiro point before the flood makes, and if the parallel of Pombas islet, where there is anchorage, can also be reached, proceed on; but if not, it will be better to anchor southward of the point, to prevent doing so farther north in deep water, rocky bottom, and in the full strength of the flood tide. Between Musqueiro and Marau points, a vessel may stand across to the westward, till on the meridian of the west part of Coutejuba island.

The depths will be from 10½ to 15 fathoms, and when they decrease to 11 fathoms, tack, and stand eastward into 9 fathoms. The lead is not a guide when standing towards Coroa Grande or Coroa Secca, as the water is deep, and the banks are steep-to, but they will probably be seen; between the parallels of Marau and Cocal points, vessels should not stand westward of the meridian of Chapeo Virado point; and when north of Cocal point, tack short of the meridian of Marau point. In standing to the eastward the lead will be a sufficient guide, tacking at a prudent distance from the shore.

From the anchorage off Musqueiro point, the second ebb will probably take a vessel north of Colares village, where she may anchor in a convenient depth, with muddy bottom, between that village and Carmo point. The third ebb tide will probably carry a vessel to Gaivotas island, during which stand westward to a prudent distance, and eastward into not less than 5 fathoms; but tack short of the meridian of Carmo point, until well northward of Correio bank.

To sail out by DENTRO CHANNEL, it is necessary to have daylight, and to be under way at high water. A vessel when standing to the north-west, should not lose sight of Tijoca point. In standing eastward, whilst Tijoca point bears eastward of E. by S., keep Taïpu point eastward of S. by E., or do not open of each other the two small islets of Rasa and Ratos. Bearings of Tijoca and Taïpu points will assist in clearing Coroa Nova and Cabeza do Sul, should the buoys be adrift.

Short tacks should now be made through the Dentro channel, standing towards Tijoca bank into 7 fathoms, and to Braganza bank to the distance of about half a mile from the breakers, bearing in mind that the ebb tide sets towards the Braganza. It often happens that a vessel does not get through in one tide; in this case anchor in 7 or 8 fathoms water on the west side of the channel. Care must be taken not to stand too near the north-east extreme of Braganza bank; the soundings in the stream of the channel will be from 12 to 15 fathoms.

The shoals and foul ground north-eastward and eastward of Dentro channel have been previously described, and must be carefully avoided.

The NORTH or MONJUI CHANNEL is generally used by vessels drawing less than 15 feet; the only danger for those of about that draught being Adonis banks, on the west side of the channel. Having worked out of the river as far as the anchorage abreast Gaivotas island, about 4 miles N.W. by N. of Taïpu point, a vessel must leave that position at high water, and steering about N. by W., will with the ebb tide running N.E. at 2 miles an hour, make good about a North course. Having lost sight of land, should the soundings decrease from 5 to 8 fathoms, to 3½ fathoms, a vessel will probably be on Monjui bank, when she should steer more to the westward till the water again deepens.

If the wind will not admit of the vessel heading N. by W., on leaving the anchorage north-west of Taïpu point, she may pass over the San João banks, where the depths are not less than 3½ fathoms at low water, and therefore at nearly high water are not dangerous. A vessel navigating this part of the entrance to the Pará with a strong working wind, cannot be guided by any positive marks, being out of sight of land, and the soundings not indicating the approach to the banks.

By keeping on the east side of the channel, but not eastward of

the west part of Taïpu point, bearing S. by W., a vessel will be clear of danger. With cape Magoari in sight from the masthead, and if in 2½ fathoms water, a vessel will be on the Adonis bank, and should make a short tack to the eastward; and if the cape be sighted from the deck when in 5½ fathoms, the vessel will be too far westward. As a rule, when the cape is distinctly seen from the deck, a vessel will be too near the Magoari or Santa Rosa banks.

The soundings over Monjui bank will indicate the vessel's position; and after passing it, the bottom, which has hitherto been of gray sand, is soft mud. If there be but little wind, and the ebb tide nearly done, it will be prudent to anchor on this muddy bottom, to prevent being carried westward by the flood; but with a fresh breeze stand to the northward, unless the soundings decrease to less than 7 fathoms.

ROUTE to the EASTWARD.—The general route to the eastward is close in shore out of the influence of the westerly current, and by taking advantage of the current, tide (*see* pages 30, 432, and 472), and every slant of wind, a sailing vessel will generally perform the voyage from Pará to Pernambuco in about 30 days. During the prevalence of E.N.E. and N.E. winds, a current sets E.S.E. along and near the north coast of Brazil; this fact is well known to the masters of the coasting craft and is taken advantage of by them. When the weather will admit a vessel may anchor off any part of the coast without danger. In working along shore, the dry season is considered preferable, as the winds are then fresh and steady. Stand off during the day, and in towards the land at night, so as to be near the coast in the morning to take advantage of the land wind, by which a good sailing vessel will make from 40 to 50 miles a day.

In the rainy season, working to windward is more tedious, as calms, light variable winds, squalls, and rain prevail; a vessel should then stand on the tack that is most favourable, and as a general rule should not go outside 30 fathoms water, and in towards the land to a prudent distance. From Pará eastward as far as the Pernaibão or Paranahiba, there are numerous rivers along the coast, and in getting in with the land attention should be paid to their streams. Should the wind be steady, tack as in the dry season, but do not lose sight of the coast.

Having arrived so far eastward as Mel point, about 15 miles eastward of Rio Mossoro, and failing to get farther to windward, a large

vessel should stand direct to the northward for about 80 miles, or until well able to weather the north-east extreme of the continent on the port tack.* A small vessel may go inside the shoals of San Roque, where she may anchor at night, and although there is not room to work through Santo Alberto channel, the water is smooth, and advantage may be taken of the land wind in the morning. No difficulty will be experienced in obtaining a pilot, in the vicinity of cape San Roque or the villages westward, for the in-shore channels.

Should, however, the mariner prefer standing direct to the northward from Pará across the equator into about 10° N., and then tack, he will save wear of men, sails, and rigging, and will probably perform the voyage to Pernambuco in about the same time.

ROUTE UP THE AMAZON, SOUTH OF MARAJO ISLAND.†—The route taken by vessels ascending the Amazon, is that leading from the river Pará, or eastern branch, south of Marajo island ; through Goiabal and Breves passes, a description of which will now be given.

LIGHTS.—In addition to the lights described on page 489, lights have been established by the Amazon Steam Ship Company, at the following positions, viz. :—At the entrance to Guajara river, abreast of the south point of Onças island ; south of Pará, on Capim island ; at Goiabal village ; at Panacuera opposite to Goiabal, at the entrance to river Tocantins ; and on Intahy island, entrance to Breves pass. These lights are *fixed* and visible about 7 miles.

Goiabal pass.—Westward of the town of Pará and of Onças island, is the main branch of the river Pará, leading to Tocantins river (*see* page 506) ; and by Goiabal pass, northward of Tocantins to the Amazon.

Between Arapiranga (northward of Onças island), and Goiabal, the channel is from 5 to 8 miles wide, and clear of danger beyond half a mile from the shore.

The Goiabal islands are separated from the south-east shore of Marajo by a narrow channel named Goiabal pass, in which the depths

* H.M. brigantine *Spy*, Lieut. T. B. Collinson, in the early part of April 1859, was 12 days trying to get 60 miles to windward when about that distance north-west of cape St. Roque. The vessel experienced during that time a current setting N. 84° W. true, 434 miles.

† *See* Admiralty chart :—Cape North to Maranham, No. 1,803 ; scale, $m = 0{\cdot}05$ of an inch.

are from 5 to 15 fathoms; the islands are connected together and to the main land to the southward, by an extensive sand-bank, which also partly covers the mouth of the Tocantins. A bank extends a good mile eastward of Janaroca the eastern of the Goiabal islets, between which and the bank extending off the light, the channel is reduced to about half a mile in width, and is further reduced to the westward, between Marumaru and Jararaca islands.

A shoal, which dries at low water, for a distance of about 2½ cables east and west, steep-to on the northern side, with shoal ground extending about 8 cables westward, and a greater distance southward from the dry part, is situated with Goiabal lighthouse bearing West, distant 3$\frac{1}{10}$ miles, from the part which dries.

Breves pass.—Westward of Goiabal pass the channel expands to a breadth of 2 to 4 miles, and maintains this breadth for about 65 miles, to the entrance to Breves pass, 16 miles east of Breves village, when it narrows to about a quarter of a mile; but between Goiabal and Breves, the channel has not less than 5 fathoms, and in some places has as much as 18 fathoms.

There is a light on Intahy island about midway between Goiabal and Breves, and on the south side of the channel. A shoal extends about half a mile south of Corralinho village on the northern shore, 6 miles east of Intahy island.

On both sides of the river are inlets cutting the coast into numerous islands. The whole country on both sides is a forest.

From the south point of entrance to Breves pass, a bank stretches to the eastward for a distance of 7 miles, and 2½ miles within its extremity is Oia islet; the shore on the north side of entrance is also fronted by a bank.

Breves.—The village of Breves is on the north bank and distant about 150 miles from Pará. It is the centre of the india-rubber trade. The flood tide runs for 3 hours, has a velocity of half a knot, and rises 6 feet.

Aturia and Oleria passes.—From Breves the channel takes a north-westerly direction for 22 miles to Aturia point, and narrows considerably. At 13 miles above Breves the channel divides; the Aturia or northern pass, with an average width of 38 yards, is used only by vessels ascending the river. Near Aturia point there is a bar with a depth of 4 fathoms at high water. Oleria, the southern

pass, has an average width of 70 yards, and is used only by vessels descending the river. These passes meet at Aturia point. The Macacos and Jabura passes which run to the northward, and communicate with the Amazon northward of Limao pass, as well as several others from the southward, communicate with the main channel near the eastern junction of Aturia and Oleria passes.*

The flood tide does not overcome the current above Aturia point; whilst the Jaburu and Macacos are subject to the regular tides.

Limao pass.—From Aturia point the channel increases its breadth to about 3 cables, and takes a general northerly direction for about 19 miles to Mutum-coara island, and passing southward of it; thence it continues westward for 17 miles under the name of Limao pass, to the west end of Curuma island on the northern bank; here the channel strikes against Ituquara island and takes its name, turning sharply west-south-west, and with a breadth of half a mile continues for a distance of 10 miles to Vieira point, the west end of Ituquara island, where it enters the Vieira branch of the Amazon, which passes eastward of San Salvador islands.

A shore extends about one-third of a mile to the southward from Vieira point.

Vieira branch.—From Vieira point, the Vieira branch, (ascending the Amazon), trends southward for 33 miles to Gurupá village on the south bank, with an average breadth of about one mile. Southward of Vieira point the eastern shore should be kept aboard until nearly abreast of Areias village, off which and Marajo river a shoal extends for half a mile; westward of the Marajo the south shore should be kept as far as Gurupá.

Gurupá branch.—The village of Gurupá stands on a rocky bank 34 feet above sea level. Abreast the village, and running from seaward along the western side of San Salvador island, the Gurupá branch joins the Vieira, and trends west south-westward from the village for 15 miles, where it is joined by the Xingu river from the southward, the first of the great tributaries of the Amazon, and 1,200 miles in length; thence its turns north-westward between Gurupá and Baxio Grande islands for 9 miles, and joins the Amazon (main) river.

* At this eastern junction, formerly, was a space 4½ miles long, by 2 miles wide, with depths of from 11 to 14 fathoms, and named the Poço or well, but which is now almost completely filled up.

A bank extends about one mile south-west of San Salvador island, at the junction of the Vieira and Gurupá branches, but in mid-channel in both branches there is deep water.

There is good anchorage southward of Jarinta point, the west extreme of Gurupá island, between that island and Baxio Grande.

AMAZON RIVER.—From the junction of the Gurupá branch with the Amazon main stream, its course (ascending the river), takes a west-south-west direction for a distance of nearly 60 miles, past the Pesquiero, Velha Pobre, and Jurupary islands, which islands may be passed on either side. The north channel is narrow and deep, and the stream runs strong. It is avoided by boats ascending the river, but is frequented by those descending. Opposite the junction, on the northern bank, is Velhas island, followed by that of Comandahy, from whence the Serra Jutahy will be seen, and which commence near the north bank at the village of Almeirim. Morro Velha Pobra rises almost vertically from the bank of the river abreast of Jurupary island, and is nearly 1,000 feet high. The water is deep in all this portion.

Paracoara island.—Prainha village.—From Morro Velha Pobre to Paracoara island the river is wide and deep, but it narrows at Paracoara island to 2½ miles; the depth increases in places to nearly 30 fathoms, and the current becomes very strong till the village of Prainha is passed, at about 40 miles westward of Velha Pobre, when the river begins to widen. Between Paracoara island and Prainha village are the Acara-assu, Itanda, and Itanduba islands, the approaches to which are clear, but near them the current runs very strong.

From Prainha to Mont' Alegre island the river is clear from one bank to the other, with a wide and deep channel.

The village of Prainha has about 300 inhabitants, and exports cattle and cacao. The Serra Urubucoara lies about 4 miles west of the village.

From Prainha to the sea the rise and fall of the tide increases rapidly from 3 feet to the maximum.

Mont' Alégre and Freixal island.—Westward of Prainha, the course of the river is about W.S.W. to Freixal island, a distance of 30 miles, abreast of which on the north shore is Mont' Alégre and village. About 10 miles west of that mount are the Serros Erere and Paytuna, with lake Mont' Alégre at the foot. This lake is one of

the largest in the vicinity of the river, and has an abundance of fish. In the rainy seasons it fills a large space, bounded on the south and east by the river, on the north by the Serra Tawari, and on the west by the river Tapará. There is a channel of deep water on either side of Freixal island, from whence the river trends to the southward for 20 miles to Siton do Toron point, abreast which, to the eastward, is Curua island, river, and sierras. The shore within 4 miles on either side of Siton do Toron point is foul for the distance of 2 cables off shore, and must be avoided. The usual channel going down, from Siton do Toron point, is near the north bank as far as Acara-assu island, then cross and keep on the south bank as far as its junction with the Gurupá branch.

Santarem.—From Siton do Toron point, the trend of the river is nearly west to the entrance to Tapajos river, a distance of 37 miles, and where on the south bank is the town of Santarem. A berth should be given to Negra point, the north point of entrance, off which a shoal extends some distance.

Marimarituba islands.—Above the mouth of the Tapajos the river runs north-westward about 20 miles as far as the west end of Maracas island, beyond which a bank stretches north-westward from the island, about one mile, and nearly joining the bank extending from Paricatuba island, where it turns to the west and south-west past Paricatuba island as far as the south extreme of Marimarituba, a distance of 12 miles. The channel between Paricatuba and the south shore is dangerous, and liable to change. From the south end of Marimarituba island, abreast of which is Sita de Piza village, the channel takes a north-westerly direction for 35 miles to Obidos, south of Meio and Mamauru islands, and where the current acquires great strength; the channel is apparently free from danger.

Lago Grande.—Between Santarem and Obidos the banks are low, and in the rainy season are almost completely under water. The south bank of the channel, abreast of Marimarituba island, alone has a steep shore, and is about 150 feet high, bounding Lago Grande on the north-east, which extends from Villa Franca on the Tapajos as far west as Obidos. Lago Grande communicates with the Tapajos by a channel near Villa Franca, and with the river by several openings west of Marimarituba, and by one west of Obidos. It is full of fish, and said to be navigable in a great part of its extent.

Obidos.—The town of Obidos with about 500 inhabitants, about 523 miles by the course of the river from Pará, stands on a bluff about 56 feet high, overlooking the river, and connected with a line of hills to the northward. This is the extreme point at which the tide is felt. There is a strong eddy close off the town near the bank fringing the shore.

Villa Bella.—From Obidos the river trends W.S.W. for 30 miles to Bom Jardin island, on either side of which there is a channel: from thence the river takes a general south-west direction past Maraca-assu, Caldeiroes, and Parintins islands, for about 60 miles to Villa Bella.

The main channel is north of Maraca-assu island, and east of that of Caldeiroes; there is also a deep channel westward of the latter island, off which a bank extends one mile southward from its southern point. Eastward and southward of Caldeiroes island, on the eastern bank, are two groups of hills known as the Serra dos Parintins, about 500 feet in height. The southern group forms the boundary between the province of Amazonas and Grao Pará.

Villa Bella has 400 inhabitants, and exports cacao.

Serpa.—From Villa Bella the river takes a west direction for 20 miles, where the bank opens out in the form of a circle nearly 10 miles across. In this portion are Pacoval and Onças islands. The channel south of these islands is the widest, but that to the northward, named Pacoval, is usually taken by steamers. Westward of these islands the river is again reduced to a breadth of about 2 miles, taking a north-west direction for 10 miles, whence it turns sharply to the south-west, with numerous islands, to Serpa, distant from Villa Bella about 135 miles. The current south of Grand Serpa island runs about 3 knots an hour.

Serpa has 700 inhabitants, and a custom-house.

Manáos.—From Serpa the river takes a south-west direction to the entrance to Madeira river, a distance of 24 miles, with a channel on either side of Trinidade island; thence the general direction is about W. by N. to Manáos, at the entrance to Rio Negro, which here joins the Amazon from the north-westward, distant 107 miles from Serpa. A bank extends half a mile or more off the south side of Trinidade island; the deep water, about 9 fathoms, being near the southern shore.

About 13 miles east of Manáos, a ledge of rocks named the Morona, extends one mile off the northern bank, leaving only a narrow channel between them and Marona island, and which requires caution in passing it.

Manáos is the capital of the province of Amazonas, it has 6,000 inhabitants and is the terminus for the steamers of the Amazon Navigation Co., trading from Pará.

Amazon.—Marañon.—The Amazon from its junction with the Rio Negro, takes a W.S.W. and then W.N.W. direction to about 65° W., where it is joined by the Japura from the northward. Westward of this junction, the river is known as the Marañon, and is said to be navigable for light draught steamers to Borja, in lat. about 4½° S., long. 77½° W.

DIRECTIONS.—Pará to Manáos.—This branch of the river has been generally described in the preceding pages, from the running survey made by the United States Government in 1878.

The uniform aspect of the banks of the Amazon, the resemblance between the islands and the various points along its course, and the absence of objects of recognition, renders it almost impossible to give fixed directions for navigating this river. It will, therefore, be necessary to employ a pilot, not for avoiding the dangers, but to prevent mistaking one channel for another. The lead should be kept going, and the main object is to avoid the great strength of the current.

Portions of the river that require great care in passing are: the channel leading from Pará town south of Onças island; the Goiabal pass; entrance to Breves pass; the west end of Aturia pass; the north bank between Prainha and Monte Alégre; and Moreno rocks near the mouth of the Rio Negro. With these exceptions, navigation is easy at all seasons.

Steamers leaving Pará at half ebb, will carry the next flood above Breves, which is important as the ebb runs very strong.

The MAIN ENTRANCE to the AMAZON.—The Amazon has two entrances northward of Marajo island; the western branch lies between Caviana and Mexiana islands, and the main land to the westward; whilst the southern branch is between those islands and Marajo island. Little is known of either; the channel leading from Pará river being that used by

the river steamers. The following information on those branches, to their junction with the Pará branch, must therefore be received with caution.*

The north coast of Marajo island forms the south side of the southern branch of the main entrance to the Amazon. The north side of this entrance is bounded by Frescas, Mexiana, and Caviana islands, all connected by an extensive bank, and which extends eastwards from Frescas island to a distance of about 12 miles, but its exact limit is yet uncertain.

From cape Magoari, the north-east extreme of Marajo island, the shore, which is intercepted by numerous rivulets, trends to the westward almost straight to San Joaquin point at its north-west end, a distance of more than 100 miles, where it trends to the south-westward. The north edge of the Magoari or Santa Rosa bank extends 14 miles eastward of the cape, but its limit is uncertain, and it should not be approached.

Mexados and Nova islets.—At 18 miles westward of cape Magoari, and 2 miles from the shore of Marajo island, is the small low woody islet named Mexados. From it a shoal extends eastward towards cape Magoari; and also to the westward, passing north of the low and woody Nova islet, and from thence along the coast for a distance of 7 miles, whence its edge trends to the south-west. Between Mexados islet and that of Nova, close to the shore, is the small group of the Bentivi and Navios islets.

Frescas island and Jurua bank.—The low small island of Frescas lies about 34 miles westward of cape Magoari, and 3 miles northward of Nova islet. Formerly there existed westward of Frescas an islet named Jurua, which was carried away by the current, leaving a bank, which now extends from Frescas island to the south-east part of Mexiana, a distance of about 22 miles. The shoalest part of the bank, about midway between the two islands, uncovers at low water, but its southern limit is uncertain.

Mexiana and Caviana islands, form with that of Frescas and the extensive bank running east and west of it, the northern boundary of the main entrance to the Amazon; they are low, wooded, and in the rainy season their savannahs, covered with water, extend over a space of more than 70 miles. The northern shores cannot be approached for a great distance, from the extensive

* *See* Admiralty chart:—Cape North to Maranham, No. 1,803.

shoals which border them. The low south shore of Mexiana island, forming a slight southerly curve, is clear of danger, with deep water all along close to the mangroves which cover it.

The south shore of Caviana island is also clear of danger with deep water, except a bank at the mouth of a river about 11 miles north-westward of Bossuti point, near its south extreme.

Cajetuba islet and **Chaves village.**—Cajetuba islet lies off the coast of Marajo, nearly abreast of the western extreme of Mexiana island, and at 4 miles westward of the village of Chaves. The village consists of about 50 houses.

Jurupari island and **Remedios isle.**—At about 15 miles north-west of San Joaquin point is the north-east point of Jurupari island, with Pacas island between. The north shore of Jurupari runs W.N.W. for a distance of nearly 14 miles. In the middle of the channel between its north-west end and the coast of Caviana is the Middle bank, with about one fathom water on it. At 18 miles westward of Jurupari is the small islet of Remedios, and from it a bank curves eastward nearly as far as Jurupari; the whole forming the southern boundary of this part of the main entrance to the Amazon.

DIRECTIONS.—Main entrance, southern branch.—A small vessel from the eastward bound to the anchorage off the town of Macapá should make the land about cape Magoari with caution, and not approach it nearer than 5½ fathoms water; then run along the land to the westward in from 5½ to 11 fathoms, passing between Nova and Frescas islands. Then steer to the south-west, southward of Jurua bank, towards a point which terminates abruptly, and remarkable by a small peak having the appearance of an island, on the coast of Marajo. From the point, steer for and along the south shore of Mexiana island.

In the middle of the channel, at about 8 miles eastward of the village of Chaves, is a ridge of rocks; its exact position is doubtful, but it is avoided by keeping Mexiana aboard, where the water is deep. At about 5 miles eastward of the west end of Mexiana is the little village of Nazareth, off which a vessel may anchor. From the west end of Mexiana, Caridade point, the south-east extreme of Caviana island is seen; it may be approached close, and the island should be kept aboard to avoid the banks on the south-western shore.

The bank at the mouth of the river, at 10 miles north-westward of Bossuti point, will be avoided by keeping 2½ miles from the shore, and by not going farther off, a vessel will pass north of the Middle bank lying southward of the west point of Caviana. When the meridian of this latter point is passed, steer about West for Pedrera point, which will soon be seen, and then close along the west shore of the main land to avoid the strength of the current, and the bank extending from Remedios islet to Jurupari island.

Anchorage.—There is anchorage in 6 or 7 fathoms north-east of Macapá fort, outside a ridge of rocks; small vessels anchor in the channel between the ridge and the main.

Above Macapá.—There are several routes from the anchorage off the town of Macapá up the Amazon; the best of which are—the eastern one, which leads along the west shore of the islands of Porcos and Gurupá; and that westward of the Pará group. The latter is somewhat difficult, but is stated to have deep water in its navigable course. From the Nova islets to the Cajary islands the channel is deep, and a vessel can pass through the middle of the Cajary group or in the channel separating them from the main land. From the Cajary group to the south point of Gurupá island, a distance of about 45 miles, the channel is clear with deep water, and although considerably narrowed by Arruans island, its navigation is said to be easy.

At the south extreme of Gurupá island is the junction of the south-east arm or Pará river, which, with the upper waters, have already been described.

The WESTERN BRANCH of the main channel to the Amazon is formed by Caviana and the smaller islands with the extensive shoals extending north-eastward from them, and the main land to the north-west. This channel is rendered dangerous by the bore (*see* page 478); and it does not appear to be frequented. In it are numerous low islands and shoals having deep water between them.

Rio Araguary.—The mouth of this river is a little northward of Balique island, the most northern of the group in the northern branch of the main channel. Here the tidal bore is extremely violent, but there is a safe anchorage, during the bore, about 5 miles within Dentro point. The river is supposed to be connected with that of Oyapok and with Mapa lake.

BALIQUE ISLAND LIGHT is a *revolving* white light *every minute*, visible *thirty seconds*, and eclipsed *thirty seconds*; it is elevated 59 feet above the sea, and should be seen in clear weather from a distance of 13 miles.

The lighthouse, 51 feet high, constructed of iron, and cylindrical in shape, rises above the keeper's dwelling, the whole painted white.

TRIBUTARIES of the AMAZON.—The principal tributaries of the Amazons on the left bank are, the Branco, which unites the province of Parà with the Guianas, the Negro which flows from Venezuela, and the Ica from New Granada. The Morona, Pastaza, and Napo, afford a communication between the northern parts of Peru and New Granada.

On the right bank are the Tocantins, the Xingu and the Tapajos, in Brazilian territory; the Madeira, in Brazilian and Bolivian territory; the Purus, Yurna and Yavari in Bolivian and Peruvian territory; and the Ucayali and Huallaga in Peruvian territory.*

Rio Negro.—This river enters the Marañon or Amazon proper in longitude 60° W., 855 miles from Pará. At the mouth of the Negro is situated the important town of Manáos, the capital of the province of Upper Amazon. Although Pará is the great port through which the trade of the Amazon passes, Manáos has become the central point of operations. Thence to Santa Isabel about 377 miles up the Negro the navigation is easy for steamers of light draught, and it is only in the dry season that there are one or two passes where the river is not more than 3 feet deep. Above Santa Isabel, which formerly had communication by steam vessels, there are rapids, but they are not difficult or dangerous, and it is said a little engineering would render the river in that part also navigable for steam vessels of light draught. Large barges, loaded with produce come down from San Carlos, in Venezuela, to Santa Isabel.

Rio Branco.—At about 180 miles above the confluence of Rio Negro with Marañon, Rio Branco flows into the former, and offers, it is said during the greater part of the year, easy navigation for steam vessels of light draught, for 200 miles, as far as the fort of St. Joaquim, not far from the frontier of British Guiana.

It is asserted that a much more rapid and easy communication

* For much valuable information on the Peruvian tributaries of the Upper Amazon, *see* an article by Lieutenant Juan Salaverry of the Peruvian navy, in *Ocean Highway*, October 1873.

may be established between Europe and Guiana and the interior of Venezuela by means of the Amazon, Negro, and Branco, than by the Orinoco; and that steam vessels could go from Pará to the frontier of Venezuela on the Rio Negro, in 27 days, and come down again in 15 days.

Rio Ica or Putumayo, enters the Marañon in longitude 68° 20′ W. Very little is known of this river; it takes its rise in the Andes in longitude 78° W.

Rio Morona.—This river rises in the province of Ecuador, on the eastern slopes of the main chain of the Andes, and falls into the Marañon, in longitude 77° W. Only a slight examination of the Morona has yet been made, but the volume of water is great, and the slow current indicates a considerable depth and that the stream is navigable. The river flows through a very fertile region, and gold washing exists on its banks. The town of Borja is near the mouth of the Morona.

Rio Pastaza after a course from north to south, empties itself into the parent stream in latitude 5° 53′ S. and longitude 76° 20′ W. This river was explored in the middle of the last century by Señor Maldonado, in a canoe, who made careful observations; but it has never been navigated by a steam vessel, so that no certain opinion can be formed as to its value as a means of communication, though its large volume, and the level nature of the region it traverses in its lower course, make it probable that it is a navigable stream.

Rio Napo rises in Ecuador, on the eastern slope of the volcano of Cotopaxi, and enters the Marañon in about longitude 72° 30′ W. The volume of the Napo is great, and the current so torpid that the waters appear almost stagnant. It traverses the renowned "land of cinnamon," first discovered by Gonzalo Pizarro and his lieutenant Orellana; and its banks, which abound in gold washings, are inhabited by well-disposed tribes. The Napo is said to possess an easy navigation by steam for 340 miles as far as a place named Puerto de Napo, when Quito may be reached in six or seven days. At its junction with the Napo, the breadth of the Marañon is 1,800 yards, and its depth more than 100 fathoms.

Rio Tocantins.—Beginning from the eastward, the first tributary which enters the Amazon from the southward, is the Rio Tocantins.

This river enters the eastern or Pará mouth about 40 miles

south-west of the town of Pará, and opposite to Goiabal pass; for the approach to which, *see* page 495.

Having passed Panacuera light, course must be shaped to pass between the two western of three islands, lying off the east bank near the entrance of the river, and between the two other islands south of them, towards the east bank of the river, along which continue for about 18 miles in not less than 4½ fathoms water (but generally in 7 and 8), then strike across S.W. to Cametá on the opposite bank, and anchor about 1½ cables off the town, in 8 fathoms water. The Tocantins becomes unnavigable, except for boats, at 120 miles above Cametá where the first rapids commence.

The land being low and thickly wooded, its general appearance is so uniform that it is difficult to distinguish one particular part from another; it is therefore desirable to obtain a pilot, but there are few who can be trusted to take charge of a vessel drawing more than 6 feet water, excepting those employed by the Amazon Company.

Cametá, 90 miles from Pará, although containing only about 3,000 inhabitants, is an important town, as the whole trade of 1,600 miles of river passes through it, the produce being brought down from the interior in small schooners and native boats. Communication is maintained with Pára by steamers. Cametá is healthy, except in the rainy season (December and January), when fever and ague prevail; the town is dry, the river bank here being 20 feet high, and the soil composed of red clay and sand; deep water runs close to the shore, and there is every facility for the construction of wharves. The water of the river at Cametá is good and fit to drink. Supplies can be obtained, beef about sixpence a pound. The principal article cultivated is cacao, which appears to grow almost wild; rubber is brought in from the country.

Tide.—The rise of the tide is 9 feet, and the velocity of the current about 2½ miles an hour.

Rio Xingu takes its rise in latitude 14° S., and flows north until it falls into the Marañon in longitude 51° 52′ W., near which is Porto do Moz.

Rio Tapajos takes its rise about 150 miles to the westward of the Xingu, and enters the Marañon in longitude 54° 40′ W. It affords a communication with the Brazilian province of Matto Grosso.

At the entrance of the Tapajos is the town of Santarem. It carries on a considerable trade with the inhabitants of Matto Grosso. This river is navigable for steam vessels for about 170 miles above Santarem, when impassable rapids are met with ; above these, boats can go to within a short distance of Diamantino, which is about 100 miles north of Cuyaba, the capital of Matto Grosso.

Rio Madeira is a most important tributary of the Amazon. It takes its rise near the city of Chuquisaca, in latitude 19° S., longitude 65° W., and falls into the Amazon in longitude 58° 46′ W. The tributaries of the Madeira are very numerous, and drain a large extent of country. For about 550 miles from its mouth, or as far as St. Antonio, the navigation of the Madeira is easy. The survey conducted by Commander Thomas O. Selfridge, U.S. Navy, has demonstrated that it is possible for vessels drawing 16 feet water to pass during nine months of the year, and by careful navigation, during the whole year, from Pará directly to San Antonio.

A channel for vessels drawing from 6 to 8 feet is always practicable.

Merchant vessels of all nations are permitted to ascend the Madeira as far as San Antonio, the current in which is not more than 1½ miles an hour.

A railway was projected and undertaken in 1878, to connect Bolivia with San Antonio, by which means the trade of this branch would be immensely increased.

At San Antonio, the difference between high and low river is 51 feet. The rainy season commences in October and ends in April, the Madeira being at its highest point about the latter month.

At San Antonio there commences a series of impassable rapids and waterfalls, 230 miles long. A little above the rapids the Madeira separates into two branches, one named the Guaporé, taking a south-easterly direction, and the other, the Mamore, the most important, a south-westerly direction.

From Guarajá up the Mamore the navigation is easy and clear, and in most places admits of navigation by vessels of 12 feet draft. The current runs at the rate of from one to 1½ miles an hour. Steam vessels of small draught can ascend the Guaporé as far as Villa Bella de Matto Grasso. The rich forests on the banks of the Madeira attract a large population from the upper Bolivian provinces, in quest of india-rubber and other products.

Rio Purus, which is supposed to rise in about 12° S., flows nearly parallel to the Madeira, and falls into the Amazon in longitude 61° W.; this river forms a small part of the boundary between Bolivia and Peru. For a distance of 750 miles from its mouth, the Purus has from 8 to 13 feet water, and for 430 miles more, from 6 to 8 feet.

Rio Yavari or Javari.—The mouth of this river is in latitude about 4° 40′ S., longitude about 70° 20′ W. 1,700 miles from the mouth of the Amazon and opposite the Brazilian station of Tabitinga which is on the frontier between Brazil and Peru. At this part the Amazon is 1½ miles wide. The Yavari is a river of considerable volume; it probably takes its rise in the Cerros de Canchaguayo which are visible from the Ucayali river, a little to the south of the village of Sarayacu; it flows north-eastward as far as latitude 5° 0′ S., longitude 71° 0′ W., where it receives a stream on its left bank called the Yavarisiñ, or Yavari-Mirim; thence its course is nearly east and parallel to the Marañon. The Yavari also receives the river Galvez on its left, and the Paysandu on its right bank. Its course is tortuous, but it is navigable for steam vessels for a considerable distance; the region drained by it is fertile, being still covered with virgin forest.

Rio Ucayali.—This important river joins the Marañon on its right bank in longitude about 74° 0′ W., and as regards volume and length of course, it is a worthy rival of the parent stream. The two most important affluents of the Ucayli are the Pachitea and the Apurimac, or Tambo. The Pachitea is formed by the rivers Pichis and Palcazu, and at first flows in a tortuous course but in a general northerly direction. At a short distance from its mouth it turns to the eastward, and finally falls into the Ucayali. The Pichis is believed to have its source in the Cordillera de la Sul and to be navigable for some distance.

The Palcazu rises in the Cerros de la Sal, receives the rivers Pozuzu and Mayra and eventually unites with the Pachitea. In 1866, the Palcazu was explored and ascended as far as the junction of the Mayru, which has been named Puerto Prado. It is near the city of Huanuco, and is the nearest point to Lima within the valley of the Amazon that has yet been reached by steam vessels. The Palcazu can certainly be navigated by steam vessels, without risk, during the rainy season, but in the dry season they are liable to get stranded. The Mayru is not navigable for steam vessels at any time.

The Apurimac or Tambo together with the Urubamba joins the Ucayali. In December 1870, when the Tambo was explored by Admiral Tucker of the Peruvian navy, it was found to be very full, with a current running out from 6½ to 8½ miles an hour. Its embouchure is 861 feet above the level of the sea, and the gradient of the stream was calculated as having a fall of 4 feet 5 inches, in a mile. The Tambo from its mouth to the falls of the Ene offers no other obstruction to steam navigation than a strong current, which probably diminishes in the dry season. But at the falls the Tambo is impassable even in a canoe.

It is not known whether there are any other obstacles above the falls, but it is believed that no impediments to navigation will be found as there are no ranges of hills in the region through which the Tambo flows. At its mouth the country is flat. At 10 miles higher up, a range of hills, 150 feet high, is met with, and the cliffs announce the proximity of rapids. The climate was found to be healthy and agreeable; the highest temperature being 86° and the mean 76°. It rained 17 times in 35 days; and the prevailing winds were N.E. from 10 a.m. to 4 p.m., and S.W. during the night. In the early morning there were light mists, the air and water being of the same temperature.

Rio Urubamba.—This river has its source in the south of the department of Cuzco, in a small lake on the western side of the Cordillera of Vilcañota, and is 14,520 feet above the sea, according to Pentland. Thence the river flows in a S.S.E. and N.N.W. direction through the vale of Yucay, the favourite residence of the Yncas, to the point where it bathes the ruins of Ollantay-Tambo. Here it changes its course to north and enters the valley of Santa Anna, finally uniting with the Tambo.

As far as it is at present known the Urubamba is navigable for steam vessels as far as Maynique. Thence the navigation is difficult. The Urubamba has less volume than the Tambo. The region drained by the former in its lower course is fertile and clothed with virgin forest. It is inhabited by Indians half civilised but of docile and friendly dispositions, hard working, hospitable, and eager to trade.

Rio Huallaga, rises in the silver bearing mountains round Cerro Pasco in about 10° S. and 76° W., and at first flows in a course from west to east through the department of Huanuco. Near the village of Muña, it encounters the chain of the eastern Andes and is forced to take a sharp turn to the north, flowing between the central and

eastern Cordilleras, and emptying its waters into the Marañon in latitude about 5° S.

The Huallaga receives a multitude of small streams and torrents on either bank, but unfortunately this fine river is only navigable for steam vessels for a distance of about 70 miles from its mouth. The Pongo, or Salto de Aguirre is a rapid which is quite impassable for steamers, owing to the force of the current and the narrowness of the gorge through which it rushes. There are other rapids higher up the river, which are difficult to pass even in canoes.

NAVIGATION of the UPPER AMAZON.—Several companies, having in all about 32 steam vessels, varying in size from 20 to 600 tons, are established for the purpose of navigating the Amazons. The principal station is Pará; they perform two voyages a month, as far as Manáos, the capital of the province of Amazonas, and 855 miles from Pará, and two to Tabatinga, 1,700 miles distant from Pará. At Manáos, cargo and passengers for places higher up are trans-shipped to smaller boats, which go as far as Yurimaguas in Peru.

A steam vessel also makes bi-monthly voyages to Cametá, a town of considerable commercial importance on the river Tocantins. These vessels, with numerous small craft and canoes that navigate the various rivers, may be considered the only means of communicating with the interior; for, although there are tracks leading into the forest from the different towns and villages, there is not a road properly so called in the province.

The distances between the principal stations are approximately as follows:—

	Miles.	
Pará to Breves	139	
Breves to Gurupá	107	
Gurupá to Prainha	122	
Prainha to Santarem	89	
Santarem to Obidos	66	
Obidos to Villa Bella	90	
Villa Bella to Serpa	135	
Serpa to Madeira river entrance	24	
Madeira river to Manáos	83	
PARÁ TO MANÁOS		855
Manáos to Coary	252	
Coary to Teffe	118	
Teffe to Fonte Boa	148	
Fonte Boa to Totantins	134	
Totantins to Santa Paulo	94	
Santa Paulo to Tabatinga	107	
MANÁOS TO TABATINGA		853

	Miles.	
Tabatinga to Loreto	35	
Loreto to Pernate	78	
Pernate to Mancallacta	10	
Mancallacta to Pevas	35	
Pevas to Yquitos	90	
Yquitos to Nauta	78	
Nauta to San Regis	35	
San Regis to Parmari	52	
Parmari to Urarinas	78	
Urarinas to La Laguna, on the river Hullaga	65	
La Laguna to Santa Cruz	35	
Santa Cruz to Yurimaguas	52	
TABATINGA TO YURIMAGUAS		643
PARÁ TO YURIMAGUAS ON THE HULLAGA		2,351
MADEIRA BRANCH.		
Pará to Madeira river entrance	772	
Madeira river entrance to Sapucaiaroca	134	
Sapucaiaroca to Boa Esperanza	33	
Boa Esperanza to Marmelos	101	
Marmelos to San Roque mission	181	
San Roque Mission to Jamery river	49	
Jamery river to S. Antonio	49	
PARÁ TO S. ANTONIO, MADEIRA RIVER	1,319	

The town of Yquitos in about 3° 44′ S., and 73° 8′ W., between the rivers Ytaya and Nanay, is the largest and most important place in the Peruvian department of the Amazon, and the centre of commerce. Here reside the commandant-general and other political and marine authorities; the population consisting of Peruvians, and Amazonian Indians, with a few European engineers and artisans.

The region traversed by the Upper Marañon from a point in about 5° 30′ S., and 78° 30′ W., is inhabited by warlike and hostile tribes of Indians known as Jibaros and Huambisas. The other villages on the banks of the upper Amazon are situated near the stations where the vessels touch. They are small, and their inhabitants are Indians reclaimed from the savage state, who carry on a little trade with Yquitos, and supply the steam vessels with fuel.

CAPE NORTH (Cabo do Norte).—The coast from the mouth of the Araguary trends about N. by E. for a distance of 25 miles to cape North, which forms the north-westernmost limit of the mouth of the Amazon; the cape is low and woody, but more elevated than the adjacent land, which is frequently overflowed.

From the cape the general trend of the coast is N.N.W. ½ W. for 145 miles to cape Cachipour, thence N.W. ½ N. for 40 miles to cape Orange. The whole shore continues low and is bounded by mangroves of moderate height, which cannot be seen at a greater distance than 10 or 12 miles, and being exposed to the varied and violent action of the waters of the Amazon and other smaller streams the outline often changes. Soft mud flats, formed by the débris thrown out of these rivers, extend off in some places to a considerable distance, upon which the mangroves advance with great rapidity in the dry season, and are torn up again by the violent current and the tides produced by the freshets in the rainy months.*

For a description of the coast westward of cape North, *see* West India Pilot, Vol. I.

SOUNDINGS.—The bottom in front of this part of the coast is composed of mud, more or less hard. The 5-fathoms line of soundings passes from 40 to 50 miles eastward and northward of cape North, and trending westward passes about 12 miles northward of Maraca island, and thence curves towards the shore near mont Mayé, to within 3 miles; it then increases its distance generally to 7 or 8 miles, until near cape Cachipour, when it trends along the coast at a distance of about 18 miles eastward of cape Orange, and 8 miles northward of it. Outside the 5-fathoms line the depth increases very gradually until near cape Orange, when the water is deeper for the distance of about 50 miles along the coast, the depth, outside the 5-fathoms line, being from 11 to 22 fathoms, and the mud mixed with fine sand.

* *See* Admiralty chart :—Surinam to cape North, No. 1,802, scale, $m = 0{\cdot}05$ of an inch.

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APPENDIX.

DIRECTIONS FROM CAPE NORTH TO CAPE ORANGE.

Jipioa island lies N.W. ½ N., 15 miles from cape North; it is very small, and being surrounded by shallow banks, is inaccessible.

The bank fronting the shore near cape North, within a depth of 5 fathoms, extends 55 miles in a north-east direction from Jipioa island, at which distance there is only a depth of 3¼ fathoms; beyond this distance it is steep-to. As this bank is dangerous in strong winds, which cause heavy rollers, it is advisable to round it in not less than 10 fathoms.

MARACA ISLAND.—The coast from cape North sweeps round to the north-west and west, forming a deep bight, in which is Maraca island, formed by recent deposits. Maraca is about 20 miles in length in a north-west and south-east direction, but divided into two parts by an opening named Calebasse creek, the western mouth of which forms a bay sheltered from the sea and strong currents which are found in the channel, and affords the only sheltered anchorage to be found off this shore.

Channels.—The channel which separates Maraca island and the main, is from 2 to 5 miles wide; its eastern entrance, named Tourlouri channel, and the narrowest part, is obstructed by mud flats, leaving a small passage near the main land for vessels of light draught. The western entrance, named Carapaporis channel, is 5 miles wide, and is the channel to the anchorage.

Anchorage.—The best position will be found with the western extreme of the north-west point of Maraca island bearing N. by W. ½ W., and the south point of the entrance to Amapa river, W. by N. ½ N.; it is said a vessel here will have not less than 19 feet at low water, and be sheltered from the current and rollers.

Directions.—When standing for the anchorage, it is necessary to approach the island from the N.N.E., as the stream runs to the north-westward. The anchorage is plainly pointed out by the opening which forms Calebasse creek, and a vessel may pass close round this

end of the island. A greater depth will be found farther off Maraca, but the current is so very strong that the anchorage would be untenable in spring tides.

TIDES.—It is high water, full and change, at the anchorage off Maraca island at 6h. 0m. The water, however, reaches its highest level 2½ or 3 hours after the commencement of the flood, and at the equinoxes it has been known to rise 37 feet and the stream to run for a short period at the rate of 7 knots an hour; its strength, however, rapidly diminishes after three or four days from the full and change. The sea at this period is heavy in the offing. The difference between the level of low water at the springs and neaps seldom exceeds 8½ feet. The stream always runs to the N.W., and at the period of high water the land is all overflowed, except at a few spots near the north-west end of the entrance to Calebasse creek.

Caution.—It may be observed here, that the toredo is most destructive to boats' bottoms in these waters, and they cannot be too often cleansed.

COAST.—Several streams enter the sea near Maraca island, two of which, the Amapa and the Manaye, communicate with extensive lagoons that occupy the low lands between Tourlouri channel and the course of the Araguary; the mouth of the Amapa is directly facing Calebasse creek.

At 13 miles N.N.W. from the Amapa river is the Mayécaré, which communicates with the Amapa; and 10 miles beyond this, in the same direction, is the Calsoene. The entrance to the Calsoene is obstructed by a sand-bank which extends off to the distance of about 3 miles, and at spring tides it breaks heavily, producing an effect similar to the tidal bore of the Amazons; at all times, but more particularly at this period, boats should be extremely careful how they approach this river.

Mont Mayé.—At about 17 miles N.W. by N. from the Calsoene, there will be seen above the mangroves, a short distance inland, a small space covered with trees more lofty than those in the neighbourhood; it has the appearance at a certain distance of a hill, and is named Mont Mayé. This is the most remarkable object between capes North and Orange, and in clear weather may be seen at a distance of 16 miles.

Conani river.—The mouth of this river is known from the many small openings between this and the Cachipour river by its approximity to Mont Mayé, from which it is distant in a northerly direction about 3 miles.

Between Mont Mayé and cape Cachipour the shore trends N. by W. about 64 miles, and is more bold than that to the southward. Abreast the Conani there are 6 fathoms at the distance of 5 miles off shore, and abreast the cape there is the same depth about 9 miles off.

Cachipour river.—Cape Cachipour, a low tongue of land, stretches to the north-east, and forms the eastern point of Cachipour river. The entrance of this river, which is about 6 miles westward of the cape, is wide, and may be recognised by some lofty trees on the west side which extending along its left bank, overtop the neighbouring mangroves.

TIDES.—It is high water, full and change, at the entrance of Conani river at 6h. 38m.; springs rise 19 feet; and at cape Cachipour at 5h. 52m.; rise from 7 to 13 feet.

COAST.—From Cachipour river, the shore trends to the northward for about 15 miles, and being low, and partly inundated is only visible about 8 miles; it then takes a north-west direction for 20 miles to cape Orange. A shallow flat extends off this part of the coast, attaining its maximum distance of 14 miles, off cape Orange, at which distance the depth is 3 fathoms. In clear weather two remarkable mountains will be seen in the interior, which are excellent guides for this part of the coast.

CAPE ORANGE.—The land about this cape is very low, but as this promontory forms the eastern side of the entrance of the Oyapok river, it is easily discernible from the eastward, and from this quarter the hills on the west side of the river will be seen behind it. The mangroves which form the extremity of the cape are much higher than those in the neighbourhood, and are visible at a distance of 12 miles. Shoal water of 3 fathoms and less extends about 14 miles eastward of the cape.

For a description of the coast, west of cape Orange, the seaman is referred to the West India Pilot, Vol. I.

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1896,

RELATING TO

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ADVERTISEMENT TO SUPPLEMENT, 1896.

This Supplement contains a summary of all the information available relating to South America Pilot, Part I., up to and inclusive of Notice to Mariners, No. 705, dated 5th December 1896, and cancels all previous Notices.

W. J. L. W.

Hydrographic Office,
Admiralty, London,
December 1896.

SO 11966—1500—10/96 Wt 13297 D & S

TO LITTLEHEXT TO SETTLEMENT 1890.

This supplement contains a summary of all the information available relating to South America. Prior [illegible] to and to date of Notes to Missions No. 705, dated 3rd December 1889, and cancels all previous Notes.

H. A. L. H.

Lieutenant-Colonel,

Adjutant-General.

December 1890.

50 11800—1500—10/90 Harrison & Sons

The existence of this Supplement is to be entered on the opening page of the South America Pilot, Part I., Fourth Edition, 1893. *The information contained in it is to be carefully considered.*

SUPPLEMENT,

1896,

RELATING TO

SOUTH AMERICA PILOT. PART I.

For later information respecting the Lights in this Supplement the Mariner is referred to the Admiralty List of Lights, Part VII.

These Lights are published annually, corrected to the previous 31st December.

FALKLAND ISLANDS.—Trade.—The exports of the Falkland islands comprise, tallow, sheep skins, wool, carcases of sheep and seal skins; and the imports, food articles, dry goods, hardware and oilmen's stores. p. 13.

The value of the exports in 1894 amounted to £131,801; and imports, £62,270.

The staple industry is sheep farming, and in 1894 the quantity of wool produced amounted to 3,808,475 lbs. of the value of £105,042.

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[FOURTH EDITION, 1893.]

Corrected to December 1896.

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The staple industry is sheep farming, and in 1894 the quantity of wool produced amounted to 3,808,475 lbs. of the value of £105,042.

During the year 1894, the number of steam vessels that entered port Stanley was 21, with an aggregate tonnage of 26,354; and sailing vessels 18, with a tonnage of 12,043. p. 13.

The population of the Falkland islands in 1894, was 1,902.

BUENOS AIRES.—Communication.—There is a fortnightly mail service from Southampton to Monte Video and Buenos Aires, by every alternate North German Lloyds steam-vessels. p. 20.

ICE.—On the 3rd March 1893, the British ship *Templemore* was crushed in the ice and lost close north of the Falkland islands in lat. 50° 20′ S., long. 58° 40′ W. p. 36.

On the 3rd June 1894, Captain H. F. Hughes-Hallet, H.M.S. *Garnet*, observed an ice island, about 10 miles in length and apparently aground, in lat. 45° 45′ S., long. 60° 45′ W. (approximate) or about 330 miles northward of the Falkland islands.

Although ice islands have been previously reported near this locality, this one is further westward than any yet seen. Mariners, are therefore warned to exercise caution when navigating between the Falkland islands and Rio de la Plata.

Cancel the route recommended for sailing vessels, lines 3 to 14, and *substitute*:— p. 37.

After rounding Cape Horn (or if from Magellan strait) pass westward of the Falkland islands, if circumstances permit (on account of greater freedom from ice), and thence to the north-eastward, crossing 40° S. in about °45 W.

If unable to pass west of the Falkland islands pass as close to the eastward as the wind will allow and thence as above.

If a foul wind is met southward of 40° S. it is better to stand to north-westward than to eastward on account of the ice usually encountered not far east of the Falkland isles.

If going to call at Monte Video keep along the land.

CHAPTER II.

ROCAS REEF.—The light on Rocas reef is reported unreliable. p. 42.

TRINIDAD ISLAND.—H.M.S. *Barracouta*, 1895, anchored in 18 fathoms, sand, abreast a waterfall on the west side of the island about three-quarters of a mile south of the monument; the best p. 43.

See charts, Nos. 2302*b* and 2203.

See chart, No. 528; and plans, Nos. 1,949 and 595.

landing place is just north of this waterfall where a rock projects out a short distance, and forms a breakwater. The bottom consists of rock to the southward and sand to the northward of the waterfall. p. 43.

On the west side of South-west bay there is a stream of good water, a short distance south of which there is a possible landing.

CHAPTER III.

OLINDA POINT.—A red buoy is moored south of Olinda reef, with Olinda point lighthouse bearing N. ⅛ E. (N. 2° E.), distant 11½ cables. The positions of this buoy and the buoys in Pernambuco road are not to be depended on. p. 69.

LIGHT.—The light on Olinda point is *fixed* white, giving alternate white *flashes* every *two minutes*, and visible from a distance of 12 miles.

PERNAMBUCO.—The population of Pernambuco and its environs is estimated (1895) at 180,000.

During the year 1895, the number of sailing-vessels entered amounted to 302, and steam-vessels 700, with a total tonnage of 1,175,572.

English bank.—Line 15 from bottom, *for* red and white vertical stripes *read* black. p. 71.

LIGHT.—Line 15 from top, *after* which exhibits *read* at an elevation of 79 feet above high water; and line 16 from top, *for* every minute *read* thirty seconds. p. 72.

TAMANDARE.—Line 8 from top, *after* sufficiently large *read* to accommodate several small vessels. p. 81.

Quarantine station *proposed.*

Maceio.—Line 20 from bottom, *after* (page *read* 30). p. 87.

RIO VARABARRIS (SERGIPE).—A buoy is placed 7 miles south-east of the entrance of Rio Varabarris, near which vessels should await a pilot. As rapid changes occur in the channel over the bar, vessels should not attempt to enter without local knowledge. p. 93.

RIO REAL.—Line 14 from top, *after* said *read* to. p. 94.

See chart, No. 528; and plans, Nos. 1,949 and 595.

See chart, No. 891; and plans, Nos. 969 and 539.

[illegible] the north of this material [illegible] and forms a [illegible] and sand [illegible] the [illegible] of the [illegible] bay [illegible] stream [illegible] distance [illegible]

CHAPTER III.

[illegible]LINDA POINT.—A [illegible] p. 69

[illegible] The point [illegible] bay [illegible] to be [illegible]

[illegible] LIGHT.—The light on [illegible] point is [illegible] every five minutes, and visible [illegible] p. [illegible]

[illegible] BRNAKBUOO.—The population of [illegible] is estimated 1869 at [illegible]

[illegible] the year 1869, the number of [illegible] entered [illegible] to 3[illegible], and [illegible] 700, with a total tonnage of [illegible] 72

[illegible] ENGLISH BANK.—Line 15 [illegible] and [illegible] is vertical p. 71 a red block

[illegible] LIGHT.—Line 15 from top, [illegible] which [illegible] red at an [illegible] p. 72. [illegible] tion of 79 feet above high water; and line 16 from top, for [illegible] minute red thirty seconds.

TAMANDARE.—Line 8 from top, [illegible] accessibility large red p. 81. [illegible] accommodate several small vessels

[illegible] quarantine station proposed.

[illegible] NICOLO.—Line 20 from bottom, [illegible] red 30. p. 87.

RIO VARABARRIS (SERGIPE).—A buoy is placed 1 miles p. 89. [illegible] of the entrance of Rio Varabarris, for [illegible] which vessels [illegible] a pilot. As rapid changes occur in the channel over [illegible] vessels should not attempt to [illegible] without local knowledge.

RIO REAL.—Line 11 from top, [illegible] red to. p. 91

[illegible] and No. 23, and place [illegible] and 30.
[illegible] No. 80; and place [illegible] 220

Buoy.—A buoy is placed 7 miles south-east of the entrance to Rio Real, where vessels should await the local pilot. The bar has two channels, one to the south-east, and the other E.N.E. of the Watch tower. Rapid changes take place in these channels. p. 94.

SAN ANTONIO BANK is marked by four buoys, viz.:— North buoy, white; South buoy, red; East buoy, red and white vertical stripes; and West buoy, black and white vertical stripes. p. 96.

Line 9 from bottom, *after* spherical *read* red.

CHAPTER IV.

BAHIA.—Buoyage.—The buoyage of the port and bay of Bahia is in accordance with the International Uniform System of buoyage, and all red buoys should be left on the starboard hand by vessels entering from seaward. p. 99.

Panella bank is marked by four conical buoys, viz.:—North buoy, black; South buoy, red; East buoy, red and white vertical stripes; West buoy, black and white vertical stripes.

Anchorage.—Vessels entering the port of Bahia after sunset are strictly prohibited from passing northward of a line drawn westward from Fort Gamboa, but must anchor south of that line.

The anchorage about three-quarters of a mile westward of cape San Antonio is foul.

ITAPARICA CHANNEL.—Jaguaripe river.—Itaypabo rock is marked by a pole surmounted by a black ball, which is to be left on the port hand by vessels entering the channel from seaward. p. 103.

The entrance to the Barra Falsa channel is marked by two conical buoys; one painted black, to be left on the port hand, and the other red, to be left on the starboard hand by vessels entering.

A submerged rock, named Pedras de Caramuans, on which the British steam vessel *Tagus* struck, lies about 4½ miles eastward of the Barra Falsa, and is marked by a black buoy. Vessels should not attempt to pass between this buoy and the mainland as other rocks may exist.

Muskoka bank.—Mr. A. Crowe, commanding the ship *Muskoka* reports having sailed over a coral bank, situated about 30 miles p. 142.

See chart, No. 891; and plans, Nos. 969 and 539.
See charts, Nos. 529, 540, and 2,262; and plan, No. 506.

south-eastward of Abrolhos. The *Muskoka* sailed 3 miles S.E. by E., obtaining soundings from 13 to 15 fathoms, coral, suddenly deepening to 34 fathoms.

RIO DOCE.—LIGHT.—On the east side of entrance to Rio Doce stands an iron lighthouse 110 feet high, and painted white, from which a *flashing red* and *white* light is exhibited, showing a *red* and *white* flash alternately at intervals of *thirty seconds*, visible in clear weather from a distance of 16 miles. p. 145.

ESPIRITO SANTO BAY.—DANGERS.—Line 3 from top, *after* reef *read* named Baixio Grande, on which the Italian steam-vessel *Napoli* was wrecked in 1893. p. 147.

Buoy.—A buoy, painted red and white horizontal stripes, with the words *Baixio Grande* on it, is moored about one cable east of the reef.

Caution.—Too much reliance must not be placed on the positions of the buoys in Espirito Santo bay.

Bar.—A bank on which there is a depth of 6 feet lies in the middle of the bar of Santa Maria river, with Balea rock bearing S.E. (S. 45° E.), distant 2¼ cables.

Line 4 from bottom, *after* the deepest water is to the *read* southward of them.

Line 16 from bottom, *after* south shore *read* passing southward of the buoys shown on the chart, thence steer to pass one cable north of Alharia point when the water deepens. p. 148.

Guarapari islets.—The master of the steam-vessel *Muguy*, 1895, reports that, during a recent voyage he observed the sea break heavily in a small area north of the Guarapari islets, apparently over a sunken rock, in a position about 3 miles south-east of Punta de Frueta, or approximately in lat. 20° 36′ S., long. 40° 18′ W. p. 149.

CAPE FRIO.—Signal station.—The semaphore signal station at cape Frio stands on a hill 624 feet high, about 1·8 miles N.N.W. from the lighthouse and 1·2 miles S. ¼ E. from Nostra Sa des Remedios. It consists of a white house with red roof and a flagstaff on the west side. p. 161.

LIGHT.—The light on cape Frio is *flashing* white and shows one flash *every twenty seconds*, each flash being followed by a total eclipse. It is elevated 174 feet above the sea, and should be visible in clear weather from a distance of 30 miles, between the bearings of S.W. ⅜ W. (S. 49° W.) and E. ⅜ S. (S. 86° E.)

See charts, Nos. 529 and 2,262.
See plan, No. 546.

CHAPTER V.

RIO DE JANEIRO.—Line 2 from bottom, *for* 350,000 *read* 600,000 in 1894. p. 165.

Trade.—The number of vessels that entered the port in 1894, was 1,297 ; cleared, 1,192. p. 166.

Feiliceiras bank.—Lines 6, 7, 8 from bottom, *erase from* Also *to* bank. p. 168.

Directions.—Line 19 from top, *for* 6 to 10 fathoms *read* 19 to 26 fathoms. p. 172.

Marambaya rock.—*Erase* foot note. p. 174.

Albrahas bay.—*Erase* foot note. p. 176.

ILHA GRANDE BAY.—Albrahas bay.—There is a telegraph station in Albrahas bay. p. 177.

Angra dos Reis.—The rocky bank a short distance south-west of Colombo islet, east side of entrance to Angra dos Reis, has on its extremity a beacon.

Algodon island.—The rock situated about one-third of a mile north-east of Algodon island on the northern shore of Ilha Grande bay, uncovers.

VITTORIA ISLAND.—Line 8 from bottom, *for* lie *read* consist of three small and partially wooded islets lying. p. 180.

LIMOES POINT.—The bank around Limoes point, east side of entrance to Santos harbour, is said to be washing away to a great extent apparently, as the pilots now (1894) conduct vessels of 20 feet draught over its northern edge. p. 183.

Wreck.—A green buoy with the letters C. S. (casco submergido) in white and surmounted by a pole marks the wreck of the German barque *Eitel Fritz*, which lies sunk near the bank extending from Limoes point, in a position with the centre of fort Barra Grande bearing E. ¾ N. (N. 81° E.), distant 10¼ cables ; and centre of Palmas island S. ¼ E. (S. 3° E.).

Population.—Line 18 from top, *for* 2,000,000 *read* 20,000. p. 183.

Buoys.—Line 5 from bottom, *omit* with staff and ball.

See chart, No. 530 ; and plan, No. 541.

See chart, No. 530 ; and plan, No. 19.

LIGHT.—Moella islet light is *flashing*, showing alternately *red* and *white* flashes every *thirty seconds*, elevated 339 feet above the sea. The lighthouse is 31 feet high with a house adjoining, painted white. p. 184.

Coals.—Messrs. Wilson, Sons & Co. have a coal depôt at Conceiçao, on the eastern shore, about 2 miles within the entrance.

Wharves.—Vessels of 23 feet draught can lie alongside the Alfandega wharf. There is a depth of 3½ fathoms alongside New quay, and depths of 2½ to 3 fathoms at the other wharves in Santos.

Patent slip.—A small slipway for vessels of 300 tons was sent out to Santos in 1891 by Messrs. Clark and Standfield, but it is not known whether it has been set up.

DIRECTIONS.—The one fathom patch shown on the plan of Santos harbour off the mouth of the Rio Santo Amaro, on the eastern shore, 1½ miles within the entrance, is said not to exist by the pilots of the port. p. 185.

Outeirinhos.—The extremity of the foul ground extending from Outeirinhos (131 feet high) is marked by a red buoy. The pilots, when between Conceiçao and Outeirinhos, steer for the latter on a N.W. ⅝ N. (N. 38° W.) bearing.

PARANAGUA BAY.—The channels leading into Paranagua bay are liable to change in direction and depths. p. 189.

SAÕ FRANCISCO DO SUL.—A rock with 6 feet water, and 4½ to 5 fathoms close around, lies in the northern approach to Saõ Francisco harbour, with Cross point bearing S. by E. ½ E. (S. 16¾° E.), distant 2¼ cables; and Peroba point E. ⅝ N. (N. 83° E.). p. 193.

LIGHT.—Line 4 from top, *after* white *read* with a red roof erected half way up the hill.

Pilots.—There are three pilots in Saõ Francisco do Sul, and vessels should not enter without local knowledge, as the positions of the buoys and beacons are very doubtful.

SANTA CATHARINA STRAIT.—Dredging operations are in progress (1896) for cutting a channel across the shoal between the northern anchorage and the City of Nossa Senhora do Desterro. The channel is to be 4 miles long, 128 feet wide, and 18 feet deep. p. 200.

See plan, No. 19.

LIGHT.—Moella inlet light is flashing, alternate white and red, and p. [illegible] not visible during every thirty seconds, elevated 32 feet above the sea. The lighthouse is 31 feet high with a house adjoining, painted white.

Costa. - Messrs. Wilson, Sons & Co. have a coal depôt on the eastern shore, about 2 miles within the entrance.

Wharves. Vessels of 23 feet draught can lie along side the landing wharf. There is a depth of 3½ fathoms alongside New wharf, and depths of 2½ to 3 fathoms alongside other wharves.

Patent slip. A small slipway for vessels of 500 tons was constructed in Sept. 1891 by M. Sens, Clerk and Schmidt, but it is not now working, whether it has been [illegible]

DIRECTIONS.—The one fathom patch shown on the plan of p. [illegible] Stone Barbour off the mouth of the Rio Santo Amaro, on the eastern shore, 1½ miles within the entrance, is said to be avoided by the pilots of the port.

Outeirinhos.—The extremity of the foul ground extending to the Outeirinhos (131 feet high) is marked by a red buoy. The pilots when between Cancieiro and Outeirinhos, steer for the lighthouse on a S.W. ½ W. (N. ¾ W.) bearing.

PARANAGUA BAY.—The channels leading into Paranaguay are liable to change in direction and depth.

SAÕ FRANCISCO DO SUL.—A rock with 6 feet water, and p. [illegible] 4 to 5 fathoms close around, lies in the northern approach to São Francisco harbour, with Cross point bearing S. ½ E. (S. ¼ E. E.) distant 2½ cables; and Ferolas point E. ½ N. (N. ¾ E.).

LIGHT.—Lined from top, water white and red, with a red conical hall way up the hill.

Pilots.—There are three pilots in São Francisco do Sul, and vessels should not enter without local knowledge, as the positions of the buoys and beacons are very doubtful.

SANTA CATHARINA STRAIT.—Dredging operations are p. 200, in progress (1896) for cutting a channel across the shoal between the northern anchorage and the City of S. ses Senhora do Desterro. The channel is to be 4 miles long, 120 feet wide, and 18 feet deep.

See plan, No. 12.

MOSTARDAS.—LIGHT.—Mostardas light is a *flashing* light *every thirty seconds*, showing *red* and *white* alternately, it is elevated 115 feet above the sea, and should be visible in clear weather from a distance of 17 miles. p. 207.

The lighthouse, in the shape of a truncated cone, is constructed of iron, painted white, and about 115 feet in height.

RIO GRANDE DO SUL.—Bell and Light buoy.—At the entrance of Rio Grande do Sul a *bell* and *light* buoy, showing an *occulting white* light *every five seconds*, is moored in a depth of 6 fathoms, with Rio Grande do Sul lighthouse bearing N. by E. (N. 11° E.), distant about 6 miles, or approximately in lat. 32° 12′ S., long. 52° 10′ W. This buoy is about 2 miles from the edge of the bank, and marks the position where vessels should stop before entering the river. p. 210.

The BAR.—Depths.—In 1893 the greatest depth on the bar was 17½ feet; least depth 12 feet.

In 1894 the greatest depth on the bar was 17½ feet; the least depth 13 feet.

Landmarks.—On the south point of the entrance stands a small settlement named Sequiëre, near which there is a high beacon erected by the company for improving the bar, and on the south shore there are three to four similar beacons. The beacon near Sequiëre may from a distance be mistaken for the lighthouse, which is surrounded by houses on Pontal de Barra, east side of entrance; the lighthouse stands just north of the Watch tower, which is a quadrangular white building half as high but larger around, with two signal masts. From this tower signals are made to the outer roadstead by the International code. The signals for the depths on the bar are made from a station further east, consisting of a small red house with a high mast. p. 214.

LIGHTS.—Line 13 from top, *after* island *read* Diamanto shoal, and *after* Estreito point *read* this light is not visible from seaward. p. 217.

Pelotas bar.—Between the first and second buoys, at the entrance to the channel over Pelotas bar, a *flashing white* light *every fifteen seconds* is exhibited from a pile lighthouse; it is elevated 23 feet above the sea, and should be visible in clear weather from a distance of 10 miles.

See charts, Nos. 530 and 2,522; and plans, Nos. 231 and 550.

See plan, No. 2,002.

[illegible]

[illegible]

[illegible]

LIGHT AND BELL BUOYS.—St. Simon bank.—A light and bell buoy is moored on the north extreme of St. Simon bank, the light is *fixed white* 13 feet 9 inches above the level of the sea, visible in clear weather from a distance of 6 miles. p. 217.

Itapuan point.—A light and bell buoy is moored off Itapuan point, the light is *flashing*, with intervals of *twenty seconds*, elevated 13 feet 9 inches above the sea, and should be visible in clear weather from a distance of 6 miles.

Banks.—Line 3 from bottom, *after* known *read* A bank of 8 fathoms was reported (1894) in lat. 33° 12′ S., long. 52° 13′ W., just within the 20 fathom line of soundings abreast Albardon de Juan Maria. p. 218.

CHAPTER VI.

Foot note.—Line 2 from bottom, *after* 0·2 of an inch *read* Monte Video to Buenos Ayres, No. 1,749, scale, $m = 0{\cdot}35$ of an inch. p. 219.

LOBOS ISLE.—The obstruction on which the s.s. *Dunkeld* was reported to have struck and foundered on 25th March 1895, one mile north of Lobos isle, was unsuccessfully searched for by H.M.S. *Beagle* in 1895. p. 226.

The sunken rock marked P.D., one mile northward of Lobos isle, has therefore been removed from the Admiralty charts.

MALDONADO BAY.—On the beach northward of Gorriti island a new pier has been built about a cable east of the old iron pier. p. 229.

The wooden pier and hut on the beach eastward of Gorriti island have been removed.

Line 11 from top, *for* dull red *read* white. p. 230.

The cathedral, 230 feet above the level of the sea, with a dome and two spires, is a conspicuous object from seaward. The dome and spires are yellow.

The Monarch.—The old cemetery, formerly used as a clearing mark for the Monarch, is entirely obscured from seaward by trees. p. 231.

Caution.—Care is necessary not to mistake the new pier for the old iron pier, as it would, when in line with Maldonado tower, lead almost over the Monarch.

See chart, No. 2,522.

Buen-Viaje reef.—Line 9 from bottom, *after* 1¾ miles. *Omit* remainder of paragraph. p. 236.

MONTE VIDEO.—Cibil dock.—Line 8 from bottom, *after* 450 feet *read* on blocks, and 470 feet over all. p. 239.

Line 7 from bottom, *for* 18 feet *read* 16 to 19 feet, and 15 to 18 feet on blocks.

The greatest beam the dock will take is 45 feet. It is necessary to lighten to 17 feet to enter the dock, and with this draught vessels have to wait some weeks occasionally for sufficient water to float out.

Foot note.—*See* Admiralty Plan, Approach to Cibil dock on sheet, No. 2,001.

LIGHT.—Line 13 from bottom, *after flashing read* white. p. 240.

Quarantine regulations.—Vessels entering the port of Monte Video will hoist the quarantine flag and anchor as convenient; but must await the visit of the Health Officer before communicating with the shore or shipping. If from a port where contagious diseases exist, vessels will avoid delay by anchoring at Flores island before proceeding to the anchorage off the town as fumigation is made before pratique is granted. p. 241.

LA PANELA.—Light-vessel.—Panela rock light-vessel is painted red and has two masts. p. 242.

SAUCE POINT LIGHT is exhibited from the end of a wharf at Sauce point. It is not visible from any part of the main channel of the Rio de la Plata. p. 244.

COLONIA.—Islets and reefs.—The reef which extends from the south-west extreme of San Gabriel island is marked by a black spar buoy. The clus er of rocks with 17 feet water and 24 feet close around, situated half a mile south of San Gabriel island is marked by a black spar buoy. p. 245.

Farallon.—Line 12 from bottom, *omit* marked by a black buoy.

Pescadores bank.—The channel between Pescadores bank and San Gabriel island is marked by 6 black spar buoys. p. 246.

See plans, Nos. 548 and 2,001.

See charts, Nos. 1,749 and 1,751; and plan, No. 2,004.

Short-Viale reef.—Line [illegible] from bottom, [illegible] p. [illegible]
[illegible] of the [illegible].

MONTE VIDEO.—Gibil dock.—[illegible] from [illegible] p. [illegible]
[illegible]

[illegible] p. [illegible]
[illegible]

[illegible] p. [illegible]
[illegible]

[illegible] p. [illegible]
[illegible]

GIFT.—Line [illegible] from [illegible] p. [illegible]

Quarantine regulations.—[illegible] p. [illegible]
[illegible] the [illegible] but
[illegible] the visit of the Health Officer [illegible]
[illegible] or shipping. If from a port [illegible]
[illegible] will avoid delay [illegible]
[illegible] to the anchorage [illegible]
[illegible] is granted.

LA PAYNELA.—Light-vessel.—[illegible] p. [illegible]
[illegible] red and has two [illegible].

NAUGE POINT LIGHT is [illegible] p. [illegible]
[illegible] point. It is not visible from any part of [illegible]
of the Río de la Plata.

COLONIA.—Islets and reefs.—[illegible] from p. [illegible]
[illegible]-west extreme of [illegible] is [illegible]
[illegible] buoy. The [illegible] of [illegible]
[illegible] situated half a mile [illegible] of the [illegible]
[illegible] spar buoy.

PARAIJON.—Line 12 from bottom, [illegible] marked by [illegible] buoy.

Pescadores bank.—The channel between Pescadores bank and p. [illegible]
the Gabriel island is marked by a black spar buoy.

See plan, No. [illegible].

See charts, Nos. 1,[illegible] and plan No. 2,[illegible]

Roadstead.—The 15 feet shoal between Laja bank and Colonia point is marked by a black spar buoy. A black spar buoy marks the southern edge of the 12 feet shoal north-westward of Colonia point. p. 246.

Caution.—Danger buoys ave white cornets, channel buoys red ones. Neither are to be depended on.

On the Government dock at Colonia there is a tide gauge, showing the depth in the channel at all times for facilitating the entering and leaving of vessels drawing more than 20 feet water. Vessels of over 16 feet draught should ascertain what the level of the river is, by sending a boat into Colonia before attempting to pass the flats south of San Gabriel island. When the tops of the rocks on Laja bank are just visible there is only 16½ feet in the channel.

Line 11 from bottom, *for* 18 feet *read* 17 feet.

Line 20 from top, *for* 18 feet *read* 17 feet. p. 247.

Buoy.—A black buoy is moored on the east side of the 15 feet patch lying N.W. ½ N. (N. 39° W.), distant $3\frac{6}{10}$ miles from Farallon island lighthouse, or approximately in lat. 34° 25½′ S., long. 57° 57¾′ W. p. 248.

CHAPTER VII.

PIEDRAS POINT.—Light-vessel.—Punta Piedras light-vessel moored in 26 feet water, E. ⅛ S. (S. 88° E.) 14½ miles from Piedras point, is painted with red and white bands, has two masts and a tower amidships from which the light is shown, and has the words *Punta Piedras* in white letters on each side. p. 251

The light is *fixed* white, elevated 42 feet above the water, visible in clear weather from a distance of 12 miles.

Buoy.—A conical iron buoy (watch buoy) is moored in 24 feet, about N.W. by W. ½ W. (N. 62° W.), distant one mile from the light-vessel.

See charts, Nos. 1,749, and 1,751; and plan, No. 2,004.

See chart, No. 1,749; and plan, No. 2,004.

ENSENADA DE BARRAGAN.—Vessels from foreign ports before entering the port of Ensenada de Barragan, must proceed to the Outer roads, Buenos Aires, to obtain pratique. (*See* p. 261.) p. 253.

Vessels should not enter the port without first communicating with the authorities on account of the crowded state of the shipping.

The jetty at the entrance to the Rio Santiago is now assigned to foreign vessels of war.

Grand Basin.—The width of the Grand Basin is 465 feet, area 46 acres; length of quayage 8,366 feet, and where the large vessels are moored there is a depth of 25½ feet.

Time signal.—A time ball drops at noon, local mean time, from the observatory at La Plata, corresponding to 3h. 51m. 44·4s. p.m. Greenwich mean time. Reported to be reliable when signal is made, but signal is not constantly given. p. 254.

LIGHTS.—Two fixed *red* lights are exhibited from the extremities of the piers of port La Plata, visible in clear weather from a distance of 4 miles.

BUENOS AIRES.—Riachuelo tidal signals.—The following tidal signals are shown from Riachuelo semaphore, to indicate the height of tide in the Boca del Riachuelo, leading to the South basin :— p. 258.

The tower of the semaphore, situated on the north side of the entrance to the South basin, is painted red, with a mast about 25 feet high, and a yard the same length. The signals are made with balls and black flags.

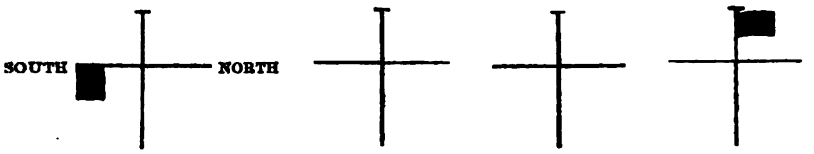
The heights are given in metres (3·28 feet) and decimetres (·328 of a foot) above conventional zero, which is 62·25 feet below the platform of the peristyle of Buenos Aires cathedral. This zero corresponds to the level of an extraordinarily low river, which is attained or exceeded, on an average, 7 times quarterly, except in winter when it occurs 30 times. How far this zero corresponds with the level to which the soundings in the Admiralty charts are reduced is not known The Riachuelo zero is said to represent 18 feet of water in the channel, consequently this amount should be added to the number shown on the signal staff in order to get the depth in the channel.

See chart, No. 2,514; and plan, No. 2,526.

See plan, No. 2,526.

This zero is unreliable and is constantly shifted. P 258.

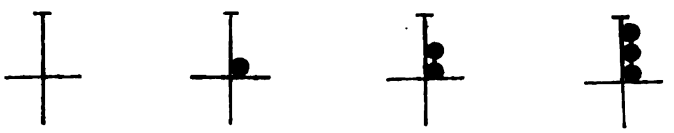
The figures represent the signals as seen from a vessel entering the port.



Tide rising. Tide falling. Tide above zero. Tide below zero.

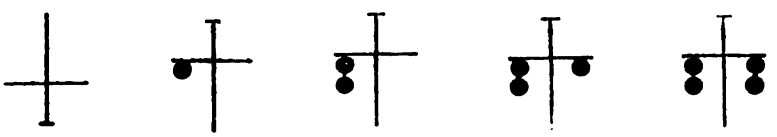
Height of tide above or below zero :—

Metres are indicated by balls hoisted to the mast, thus :—

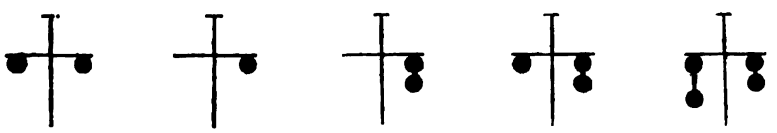


0 metre. One metre ($3\frac{1}{4}$ feet). 2 metres ($6\frac{1}{2}$ feet). 3 metres ($9\frac{3}{4}$ feet).

Decimetres are indicated by balls at the yard-arms, thus :—



0 decim. One decim. ($\frac{1}{3}$ foot). 2 decim. ($\frac{2}{3}$ foot). 3 decim. (One foot). 4 decim. ($1\frac{1}{3}$ feet).



5 decim. ($1\frac{2}{3}$ foot). 6 decim. (2 feet). 7 decim. ($2\frac{1}{3}$ feet). 8 decim. ($2\frac{2}{3}$ feet). 9 decim. (3 feet).

To indicate that no signals are being made at the semaphore, a flag is hoisted to the masthead, and another to the northern yard-arm.

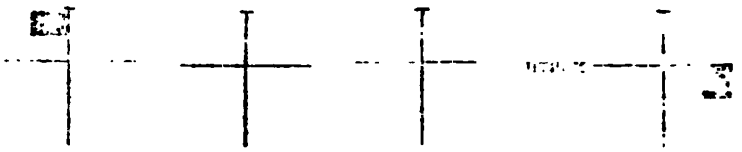
The mean height of the water varies with the prevailing wind. The extreme levels observed have been $7\frac{3}{4}$ feet below and $11\frac{3}{4}$ feet above zero.

When a falling tide reaches zero, a sluice is closed at the lock between South basin and Dock No. 1, thus retaining a minimum depth of 22 feet in the basins of the port.

See plan, No. 2,526.

[illegible] impossible and is consequently shifted.

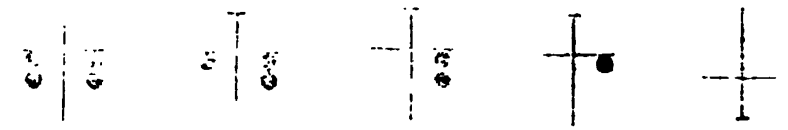
The signals represent the signals as seen from a vessel entering port.

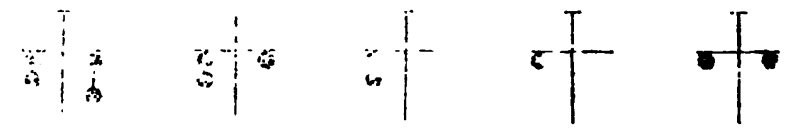


[illegible] above zero:—

[illegible] lot to the tank, [illegible] as:—

[illegible] are made and by bells at the pendulum, thus:—





[illegible] no signals [illegible] the semaphore, as [illegible] to the [illegible] tide [illegible] pendulum.

The room [illegible] of [illegible] with the pendulum [illegible]. [illegible] extreme [illegible] observed [illegible] 11½ feet above zero.

When a falling tide reaches [illegible] sluice is closed at the lock between South basin and Dock No. 1, thus retaining a minimum depth of 22 feet in the basins of the port.

[illegible]

A white flag means the lock is clear and a vessel can enter; a red ball means another vessel is coming through; the latter is also stop signal. p. 258.

The gates are opened on the approach of a vessel from 7 a.m. to 5 p.m. daily: before and after those hours notice must be given.

Docks.—Lines 3 and 4 from top, *omit* pile beacons, and line 19 from top, *for* 21⅝ feet *read* 23¾ feet.

Line 20 from top, *after* width of entrance, *read* 66 feet, depth on sill.

Line 21 from top, *after* 66 feet *read* depth on sill 23¾ feet.

Line 23 from top, *after* 66 feet *read* depth on sill 23¾ feet.

Line 24 from top, *for* 21 feet *read* 21½ feet.

It is proposed to construct a dock at the north end of the port for the use of the Argentine Government.

A depositing dock, length over all 325 feet, breadth of entrance 75 feet, depth over blocks 22 feet 6 inches, and lifting power of 7,500 tons, building by Messrs. Clark and Stanfield (1894), will probably be placed at La Plata when complete.

LIGHT VESSEL.—*Omit* lines 1, 2, 3, 4, from top. p. 259.

Quarantine regulations.—The quarantine buoy at Buenos Aires in lat. 34° 37′ S., long. 58° 5′ W., is a yellow buoy marked *Caurentena*, in small black letters. All vessels arriving from foreign ports are obliged to anchor eastward of the line between Quarantine buoy and Quilmes church, and should hoist a yellow flag at the fore by day, and a red light at night, until visited by the Health Officer, who leaves the port of Buenos Aires about 9 a.m., and returns from the roads between 1 and 2 p.m. No vessel from a foreign port is allowed to pass westward of this line until granted pratique. p. 261.

Vessels having contagious diseases on board, or arriving from a port against which quarantine has been declared, must ride out their quarantine eastward of this line.

The lazaretto for the sick and for those to be kept under observation is on Martin Garcia island.

See plan, No. 2,526.

Tides.—It is high water, full and change, at Buenos Aires at 6h.; springs rise about 4 feet. The time of high water is regular, but the height of the mean level of the water is so much affected by the winds, that the movements of the tides are sometimes almost lost. The flood runs 5h. 20m., and the ebb 7h. 5m. from one to 2 miles an hour. The winds from the south-east cause the level of the water to rise, and those from the north-west depress it. p. 262.

The mean monthly level of the river is highest in December and January, and lowest in June and July, the difference being about one foot.

The mean monthly tidal range is about 3 feet in December and January, when it is greatest, and 2 feet in June and July when it is least.

The mean monthly range from the highest to the lowest levels is about 7 feet.

The exteme levels so far observed, viz., the flood of 30th August 1860, and the low water of 2nd May 1890, differ 22 feet. The flood was about 10 feet above, and the low water about 12 feet below, the mean level of the river.

Soundings.—Mr. E. J. Evans, Master R.M.S. *Tainui*, 1895, reports having obtained a depth of 10 fathoms about 45 miles east of Rouen bank; position as given, lat. 35° 59′ S., long. 55° 3′ W. p. 265.

Wreck.—The Italian barque *Tomasino* lies sunk in a depth of 4 fathoms, with topmasts showing above water, in a position with El Cerro lighthouse, Monte Video, bearing N. 22° E. distant about 20 miles.

Approximate position, lat. 35° 11′ S., long. 56° 27′ W.

CUIRASSIER BANK.—Wrecks.—The wreck of an old wooden vessel, much broken and partly bottom up, is reported to lie in approximately lat. 35° 9′ S., long. 56° 50′ W. p. 266.

The wreck of the Italian barque *Battistina Rasseti* (*Rapto*) lies with Indio point North Grove bearing S. 57° W., distant 19¼ miles, or approximately in lat. 35° 8′ S. long. 56° 33′ W.

Line 13 from top, *for* India *read* Indio.

See plan, No. 2,526.

Pilot schooner.—A pilot schooner is permanently stationed eastward of Cuirassier bank (Indio point) light-vessel. p. 266.

By day.—The schooner flies a *red* flag with a *white* ball at the fore truck.

By night.—A *red* light is shown, also a *white* light amidships and a *white* light aft.

BANCO CHICO light-vessel is painted black with a broad red band, and has *Banco Chico* in large white letters on each side. The vessel has two masts, the foremast is the higher, from which the light is exhibited; the tops of the masts are painted white, the remainder red. p. 268.

Directions.—Line 10 from bottom, *for* 267 *read* 247. p. 273.

CHANNELS.—Martin Garcia channel.—All the buoys in Martin Garcia or Main channel have been withdrawn with the exception of El Globo (No. 3 red) buoy in approximately lat. 34° 18¼′ S., long. 58° 5¾′ W. p. 283.

The four buoys previously marking the northern side of this channel north-east of Martin Garcia island, have been moved to mark the north side of the narrow shoal, the extremities of which bear N. ¾ E. (N. 8° E.), distant 8 cables, and N.W. by W. ¼ W. (N. 59° W.) $2\frac{4}{10}$ miles from Martin Garcia lighthouse.

Buenos Aires channel.—A new channel has formed west of Martin Garcia bank, with a depth of 11 feet water (1894), and has been named Buenos Aires channel.

Omit paragraph *between* lines 12 and 19 from bottom.

Las Conchillas channel.—The new (dredged) channel between San Pedro and Las Conchillas banks, has been named Las Conchillas channel; and is marked on its south side by nine black buoys, numbered consecutively from one to nine, which must be left close on the port hand entering from seaward.

In 1895 there was a depth of 14½ feet at low water in Las Conchillas channel.

See charts, Nos. 2,544, and 1,749.

See charts, Nos. 1,749 and 1,751.

Fish schooner.—A pilot [illegible] p. 290.

[illegible]

[illegible]

Gem.—A red light is [illegible] p. [illegible]

BANCO CHICO light-vessel is painted black with a broad p. 290.
[illegible] two masts, the foremost [illegible] the top of the [illegible] p. [illegible]

Directions.—Line 10 from bottom, for 290 read 217. p. 274.

HAXMELS.—Martin Garcia channel. [illegible] p. [illegible]

[illegible]

Buenos Aires channel.—A new channel has formed in the mouth of the River Uruguay, with a depth of 11 feet [illegible] p. [illegible] named Buenos Aires channel.

Navy paragraph following line 12 and 19 from bottom.

Las Conchillas channel.—There is a [illegible] channel between the Island Las Conchillas and the main [illegible] channel; and is more [illegible] side by nine [illegible] channel commencing [illegible] which must be left [illegible] on the port hand entering from seaward.

In 1890 there was a depth of 11 ft. [illegible] in last month [illegible] channel.

Admiralty No. 2411 and 2412.
Admiralty No. 1 [illegible] and 1491.

HERRADURA BANK.—Four (black) buoys mark the eastern edge of Herradura bank, westward of Dos Hermanas bank. The buoys previously marking the western edge of Dos Hermanas bank have been withdrawn. p. 284.

CANAL del INFIERNO has been completely abandoned (1894). p 285.

Omit paragraph *between* lines 3 and 21 from top.

PARANA RIVER.—The river water above Parana, except between Corrientes and the Rio Vermejo, is fit for drinking. p. 291.

Omit lines 18 and 19 from bottom.

Asuncion.—Coal can be obtained at Asuncion, but it is of indifferent quality and expensive. p. 294.

Population of Asuncion in 1894 was 25,000.

CHAPTER VIII.

MEDANO POINT.—LIGHT.—Line 15 from top, *for* On Medano point *read* In a position about 7 miles northward of Medano point. p. 297.

Mogotis point.—Mogotis point and the adjacent land are 5 miles more to the northward and 2 miles to the westward of the coast, as depicted on chart No. 1,324; and the position of the lighthouse is lat. 38° 5′ 40″ S., long. 57° 31′ 15″ W. p. 298.

BAHIA BLANCA (PORT BELGRANO).—Bahia Blanca light-vessel is moored in 5½ fathoms at the entrance to Bahia Blanca, in a position S. 17° E., distant 13 miles from mount Hermoso lighthouse. The light-vessel is painted red and black in horizontal stripes, and has two masts, with a tower amidships, from which an occulting white light is exhibited with a period of *one minute* thus :—light, *forty-two seconds;* eclipse, *eighteen seconds*, and is visible in clear weather from a distance of 14 miles. p. 302.

Buoy.—A red buoy has been moored on the south side of the channel leading to port Belgrano between Nos. 7 and 8 buoys, in a position with Tripod, bearing N.E. by E. ½ E. (N. 62° E.), distant $3\frac{7}{10}$ miles; and Punta Alta, N.W. ¾ W. (N. 53° W.) p. 305.

See charts, Nos. 1,749, 1,751, and 1,938.

See charts, Nos. 1,962*a*, *b*, *c*, 1,324, 1,329; and plan, No. 1,331.

CHAPTER IX.

Foot note.—Line one from bottom, *for* lat. 4° 7′ S. *read* lat. 47° S. p. 353.

CHAPTER X.

EAST FALKLAND ISLAND.

STANLEY HARBOUR.—Line 22 from top, *after* government. *read* There are three jetties abreast the town, the easternmost (Falkland Island Co.) has a depth of 9 feet at its extremity; the middle Dean jetty (Falkland Island Co.) 12 feet; and the easternmost (Government jetty) 9 feet. p. 374.

Lines 1 and 2 from bottom, *after* *See* Admiralty plan:—*read* Stanley harbour, No. 1,614; scale, $m = 6$ inches.

Tides.—Line 19 from bottom, *for* 5 h. 15 m., read 5 h. 40 m. p. 375

LIVELY ISLAND.—There is a settlement on the north side of Lively island, about one mile east of the anchorage in Kelp bay. p. 386

CHAPTER XI.

WEST FALKLAND ISLAND.

PORT SAN CARLOS.—There are two settlements in port San Carlos, one in Careening cove, and another on the east side of the South arm. p. 396.

PORT HOWARD.—There are two settlements in port Howard, one at the head of the North arm, and another at the entrance of a small inlet on the west side of this arm. p. 398.

ELEPHANT BAY.—Line 7 from top, *after* northward *read* There is an Admiralty reserve on the west side of Elephant bay. p. 403.

KEPPEL ISLAND.—Line 2 from top, *after* station; *read* north of this station there is an Admiralty reserve. p. 404.

PORT EDGAR.—The settlement in Port Edgar is at the head of a creek about three-quarters of a mile deep on the west side of the southern arm of the port, there is a flagstaff at the settlement, and a landing pier about 150 yards east of it. p. 420.

ISLANDS AND ROCKS SOUTH-EAST OF FALKLANDS.

SHAG ROCKS.—Lieutenant C. H. Kempson, R.N.R., reports that, from observations taken by him when passing Shag rocks, he found these rocks to lie 20 miles westward of the position as now charted. p. 421.

Also, that about 18 miles eastward of Shag rocks, there is shallow water with a rock awash. This did not appear of any great extent.

Position of Shag rocks as now charted, lat. 53° 50′ S., long. 43° 25′ W.

SOUTH SHETLAND islands.—Dundee island, discovered by Captain Robertson while on a whaling voyage in the British ship *Active*, 1893, is 150 feet high, about 2 miles long in a north-west and south-east direction, and separated from the south side of Joinville island by a channel half a mile wide, named Firth of Tay, through which the *Active* sailed. p. 428.

CHAPTER XII.

RIO CAMOCIM.—LIGHT.—On point Do Trapia, western side of entrance to Rio Camocim, is exhibited a *fixed* and *flashing white* light, showing a *flash every thirty seconds;* elevated 45 feet above the sea, 34 feet above the ground, and visible from a distance of 12 miles in clear weather. p. 446.

The lighthouse is an iron column, with a gallery and staircase, and the keeper's dwelling attached, all painted white. Approximate position, lat. 2° 51′ 30″ S., long. 40° 52′ 50″ W.

Perguiças river.—The bar of the Perguiças river, in lat. 2° 35′ S., long. 42° 45′ W., is marked by buoys. p. 449.

See charts, Nos. 1,354*a* and *b*; and plans, Nos. 1,774, 1,614, 2,671 and 1,874.

See charts, Nos. 2,202B and 1,238.

CAPE GURUPI.—Mercur rock.—The brigantine *Mercur* (1893) drawing about 12 feet water, struck and was lost on a rock, over which the sea was breaking heavily, situated with cape Gurupi bearing about S.S.E. ½ E. (S. 28° E.), distant 15 miles. p. 465.

Approximate position as given, lat. 0° 42′ S., long. 46° 22′ W.

ATALAIA POINT.—Fraden shoal.—A shoal on which the Norwegian barque *Fraden*, of 18 feet draught, and other vessels have struck, is reported to lie E. ¾ N. (N. 82° E.), distant about 6 miles from Atalaia point; or approximately in lat. 0° 34′ S., long. 47° 15¼′ W. p. 467.

BRAGANZA BANK.—Light vessel.—Line 8 from bottom, *for* 4 miles *read* 10 miles, and at times only 4 miles. p. 479.

GAVIOTAS.—LIGHT-VESSEL.—Line 9 from top, *after* E. by S. ¼ S. *read* $2\frac{8}{10}$ miles. p. 481.

Line 10 from top, *after* This vessel *read* is painted white, has two masts and—

CHAPEO VIRADO LIGHT.—Line 7 from bottom, *after* fixed *red read* elevated 36 feet above high water, and should be— p. 484.

Line 8 from bottom, *for* 13 miles *read* 11 miles. The light is exhibited from an iron standard, white.

Pinheiro point.—Line 7 from bottom, *after* distance *read* The shoal half a mile west of Pinheiro point is marked by a conical red buoy. p. 486.

PARA RIVER.—Line 2 from top, *after* avoided *read* This rock is marked by a conical red buoy. p. 487.

Line 8 from top, *after* low water, *read* and surmounted by a white cone shaped beacon, 15 feet high.

Line 7 from top, *after* Europeans *read* yellow fever endemic and occasionally very bad, especially amongst the shipping. Diphtheria endemic is rather common. Malarial fever, usually taking the intermittent form with ague, is very prevalent and of a severe type. p. 488.

Line 9 from top, *for* 1884 *read* 1894, and *for* 60,000 *read* 70,000.

See charts, Nos. 528, 1,803, and 2,186.

See chart, No. 2.186.

Submarine telegraph.—Line 15 from bottom, *after* Pernambuco *read* also with Manáos (*see* p. 505). p. 488.

Coal.—Line 2 from bottom, *for* 4,000 to 5,000 tons *read* 7,000 to 8,000.

Exports, Imports.—The exports consist principally of rubber, cocoa and Brazil nuts; and the imports of coal, manufactured goods, mules and bullocks. p. 489.

Pilots.—The pilot boats off Salinas point are painted red, with the letter P on the sail, and at night a light is exhibited from the mast-head. p. 490.

See chart, No. 2186.

[illegible] **telegraph.**—Line 15 from bottom, after [illegible] 2 insert with Mauritius [illegible] p. 55.

Coal.—Line 2 from bottom, for 4,000 to 5,000 read [illegible] 1,000 [illegible]

Exports. Imports.—The exports consist p[illegible]ally of rubber, p[illegible] and [illegible] and the imports of [illegible] manufactured goods, [illegible] foodstuffs.

Notes.—The pilot boats of Salonica are painted red, white the [illegible] [illegible] the coal, and at night a light is exhibited from the [illegible]

[illegible] No. [illegible]

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